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MONITORING REPORT ON THE GLANBROOK LANDFILL SITE

1983

SPEC. COLLECTION (STACKS)

ANNUAL OPERATIONAL MONITORING REPORT (1983)

FOR THE

REGIONAL LANDFILL SITE IN GLANBROOK

M O R R I S O N B E A T T Y L I M I T E D
4500 Dixie Road
Mississauga, Ontario
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FEBRUARY, 1984
PROJECT NO. 386-831

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February 8, 1984

Mr. R.F. Palombella
The Region of Hamilton-Wentworth
Department of Engineering
71 Main Street West
Hamilton, Ontario
L8N 3T4

Dear Mr. Palombella:

re: Annual Operational Monitoring Report (1983)
for the
Regional Landfill Site in Glanbrook
Your File No. E309-096
Our File No. 386-831

We are pleased to submit to you the Annual Operational Monitoring Report (1983) for the Regional landfill site. The report includes all 1983 monitoring data as extensions of previous years' tables and graphs, interpretation of trends, and recommendations for future monitoring.

Thank you for the opportunity of preparing this report.

Yours very truly,
MORRISON BEATTY LIMITED

Nancy Rennie

NJR/lf

Nancy J. Rennie, B.E.S.
Environmental Geomorphologist

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 MONITORING PROGRAM 1

3.0 MONITORING RESULTS (1983) 3

3.1 Water Levels 3
3.2 Groundwater Quality 4
3.3 Surface Water 6

4.0 METHANE GAS 6

5.0 CONCLUSIONS 7

6.0 RECOMMENDATIONS 8

1.0 INTRODUCTION

As requested by Mr. G.S. Spencer of the Engineering Department, Regional Municipality of Hamilton-Wentworth, we have prepared the 1983 Monitoring Report for the Regional Landfill. All monitoring data made available by the Region has been incorporated into this report.

2.0 MONITORING PROGRAM

Monitoring of the landfill leachate, groundwater and surface water has been carried out since 1980. Leachate is sampled from the leachate collection system manholes (Manholes 1 through 7) surrounding Cells 1 & 2. Groundwater quality is currently monitored from nine (9) nests of piezometers, three of which are used as background wells. (BH 1a, BH 5 and BH 17) An additional piezometer nest was established in December, 1983 (BH 26) by Morrison Beatty Limited. Three surface water sampling points have been established on Buckhorn Creek. The sampling points are shown on Figure 1 (Appendix A).

The 1983 monitoring dates are listed below:

Monitoring Station	Date, 1983
1. Groundwater	
BH 1, 5, 12, 14 & 17	October 31
BH 13, 22, 24 and 25	January 28 April 26 July 28 October 31
2. Leachate	
MM 1 and MH 4	January 28 April 26 July 28 October 31
MH 2 and MH 3	October 31
MH 5, 6 and 7	April 26

3. Surface Water

Buckhorn Creek (upstream and Townline Road)	January 28 October 31
Buckhorn Creek (downstream)	October 31

The monitoring program consisted of both water level measurement and sample collection for each well and manhole. We understand the wells were flushed before sample collection, however, the volume of water removed was not recorded. The stream monitoring did not include flow measurements; however we understand that investigations into methods of monitoring flow in this intermittant stream are in progress. The water level data is listed in Tables 1A, 1B and 2A (Appendix B). The water quality data for all sampling points is listed in Tables 3 to 36 (Appendix B).

The 1983 groundwater samples were analyzed for the following parameters:

Conductivity	Iron
pH	Nickel
Chlorides	Zinc
Hardness	Chromium
Sulphate	Copper
Total Kjeldahl	COD
Nitrate	BOD (no analysis on January 28 samples)
	Phenols

The samples from the leachate collector system (MH 1 to MH 7) were analyzed for conductivity, pH and chloride. The three stream samples were analyzed for conductivity, pH, chloride plus dissolved oxygen.

Methane gas monitors are located around the perimeter of the landfilled areas. Four monitors (GM 1 through 4) were tested for methane gas in 1983.

They were monitored on four occasions:

January 31
February 21
April 29
August 31

3.0 MONITORING RESULTS (1983)

3.1 Water Levels

The 1983 water levels show consistent downward hydraulic gradients at all piezometer nests except BH 12, 17 and 22. The downward gradients indicate recharge conditions. Upward gradients at BH 12 and 17 appear to be seasonal, since previous gradients have been downward at these wells. The wells appear to be located in a transition zone between upland recharge areas and valley discharge areas.

Water level hydrographs were prepared for the typical well nests. They are shown on Figures 2, 3 and 4 (Appendix A). In each case, it is noted that the shallowest wells (water table) responds to seasonal infiltration events; whereas the deepest wells respond much slower to seasonal changes in infiltration. The water level response is more variable in the recharge area (BH 13) than the discharge area (BH 17). The lack of correlation between water level fluctuation in the shallow and deep wells attests to the low permeability of the till.

The hydrographs for the two wells at BH 22 (Figure 4) were plotted to examine the anomalous recovery of water in the deep well in January, April and July of 1983. Comparison of the graphs with the other well nests suggests that water level data for the two were accidentally switched. We believe the correct data is as shown on the hydrographs.

The water levels in some of the leachate collection system manholes dropped up to 1.5 m between the April and October monitoring. This was probably the result of pumping which was done to allow for the extension of the leachate collector system.

3.2 Groundwater Quality

All chemical analyses for the samples collected in 1983 are summarized in Tables 2 to 36 (Appendix B). Previous years' data is also included. Conductivity, pH, chlorides, sulphates and COD are plotted on graphs (Appendix C) for selected manholes and piezometers. The 1983 range of concentrations of key leachate indicators for selected shallow, intermediate, and deep background wells is listed below. Averages are listed in parentheses.

BACKGROUND WELLS

	Conductivity (umhos/cm)	pH	Chloride (mg/L)	Sulphate (mg/L)
Shallow wells: (BH 1a-III, BH 5-III and BH 17-III):	300-1700(1100)	6.8-7.3(7.1)	12-100(47)	30- 900(568)
Intermediate wells: (BH 1a-II, BH 5-II and BH 17-II):	300-1800(1177)	7.0-7.6(7.2)	12-148(75)	40-1000(588)
Deep wells: (BH 1a-I, BH 5-I and BH 17-I):	170-2000(1257)	5.7-7.0(6.5)	4.9-141(90)	27-1350(767)

The range of strengths is within the natural range of previous monitoring. COD was not previously monitored. It ranged between 5 and 51 mg/L at all depths.

Leachate quality from manholes in the leachate collector system show the following range in concentrations. Averages are listed in the parentheses.

Conductivity (umhos/cm)	pH	Chloride (mg/L)	Sulphate (mg/L)
800-6000(3246)	5.5-7.0(6.7)	37.5-900(191)	1400-1720(1578)

The quality of leachate is only slightly elevated above background groundwater quality. Graphs for MH 1 and MH 4 (Appendix C) show an increasing trend for chloride and conductivity. PH decreases slightly due to the acidity of the leachate.

Piezometer nests located at the toe of the landfill (BH 13, 22, 24 and 25) had the following range in concentrations for key leachate indicators in 1983. Averages are listed in the parentheses.

MONITORING WELLS

	Conductivity (umhos/cm)	pH	Chloride (mg/L)	Sulphate (mg/L)
shallow wells	1500-2820(2728)	6.8-7.3(7.0)	1.0- 55(33)	775-3150(1619)
intermediate wells	290-6000(2668)	6.7-7.8(7.1)	30-152(65)	62-5100(1896)
deep wells	900-2940(2358)	6.7-7.5(7.15)	69-245(180)	365-1675(1132)

There is no firm evidence that these wells are affected by landfill leachate. The contrast between background groundwater quality and leachate quality is very subtle making it difficult to determine the extent of leachate impacts, if any.

The trend of improving water quality at BH 12, which was identified in 1982, has continued. This well is upgradient of natural shallow groundwater flow but may eventually be affected by a reversal in groundwater flow if mounding of the water table in landfill material occurs in Cell 2.

Iron continues to be high at BH 24 II and III (up to 14.9 mg/L). Background concentrations of iron range from 0-3.5 mg/L. This is probably a natural anomaly since the other wells at the edge of the landfill did not show concentrations of iron above background. Iron strengths in the leachate are not monitored.

3.3 Surface Water

Surface water samples were obtained on two occasions in 1983 (January 28 and October 31). The upstream water quality (Table 34) shows lower conductivity, chloride and dissolved oxygen concentrations than the quality at the Townline Road (Table 35) and downstream from the site (Table 36). The increased chloride in the downstream samples could be attributed to road-salting. Further monitoring is necessary to determine if the landfill activities have an impact on Buckhorn Creek.

4.0 METHANE GAS

There were four landfill gas monitoring probes in the vicinity of the site in 1983. An additional gas probe (GM 5) was installed in December, 1983.

The results of the monitoring program are shown on the following table:

Percentage Methane (CH_4) By Volume (1983)

Probe	Jan 31	Feb 21	Apr 29	Aug 31
GM 1	.5	.25	0	0
GM 2	.25	.25	0	0
GM 3	.25	.25	0	.25
GM 4	.25	.25-.5	0	.10

All measurements are trace amounts and are below the lower explosive limit of 5% methane by volume. Methane migration through the clayey soils at this site should be limited to a few metres. As long as building is not allowed on the landfill or immediately adjacent to it, there should be no future hazard from methane at this site.

5.0 CONCLUSIONS

Leachate quality at this site is weak compared to older sites; however, some increases in conductivity and chlorides were noted in 1983.

There are no measurable impacts of leachate on groundwater in the immediate vicinity of the landfill. Concentrations of conductivity, chloride and COD appear slightly elevated in some of the shallow and intermediate wells at the landfill edge, however the changes could be due to natural causes. Graphs of chloride, pH and conductivity show fluctuations within a natural range for groundwater in the till.

There were some increases in conductivity, chloride and dissolved oxygen in Buckhorn Creek downstream from the site; however, there is no firm indication that this can be attributed to the landfill activities.

Methane gas is not a problem at this site at this time due to the impermeable nature of the clay soils, the low quantities of the gas, and the isolated location of the site from development.

6.0 RECOMMENDATIONS

As a result of our review of the monitoring data and trends at this site, we make the following recommendations:

1) Monitoring should continue as in 1983, with quarterly samplings at the well nests located at the edge of the landfilling area and at least one background well nest; however, this could be limited to the shallow wells with the deep and intermediate wells and leachate sampled only once a year. OK

2) Analyses for COD should be continued as one of the routine parameters. DOC should be added to the list of parameters. It is the best indicator of the organic content of leachate.

3) Most metals are known not to migrate beyond a few feet of landfill sites. It may be advantageous to reduce the number of metal analyses and substitute the major ions that are not presently included (i.e., sulphate, magnesium, potassium, sodium, calcium and bicarbonate). A complete ionic balance should provide a clearer indication of leachate migration.

4) Leachate production rates should be monitored to establish trends. Therefore, leachate levels in the manholes should continue to be monitored. If leachate is pumped out for other disposal, the leachate quantities and dates of pumping should be recorded.

5) Investigations into methods of accurately monitoring the flow in Buckhorn Creek should continue. Flow measurements are needed on each sampling date in order to calculate dilution factors. There is no need to sample ponded or standing water in the watercourse (under no-flow conditions) since they are not useful in assessing off-site impacts.

Respectfully submitted,
MORRISON BEATTY LIMITED

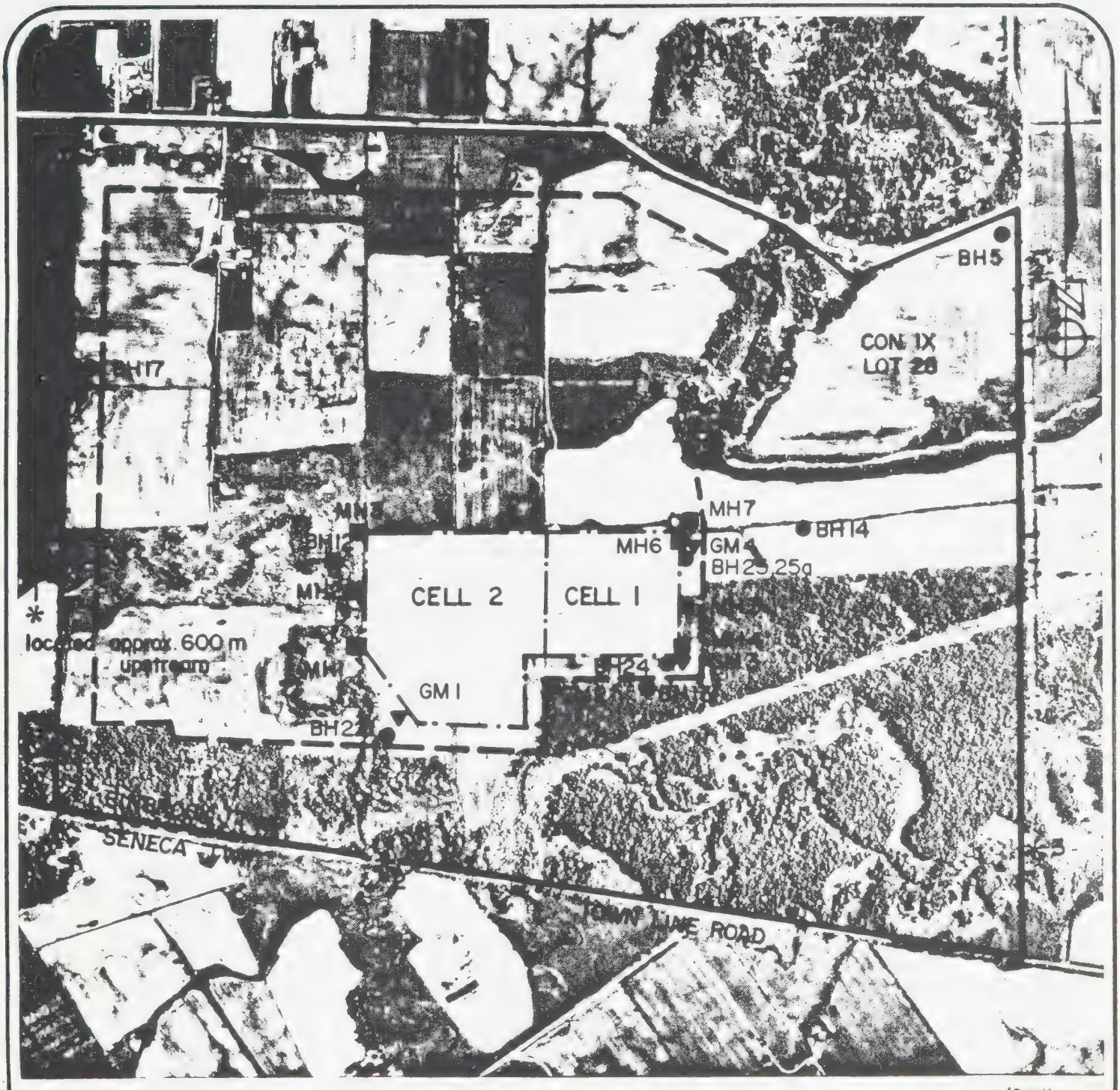
Nancy J. Rennie, B.E.S.
Environmental Geomorphologist

REGISTERED PROFESSIONAL ENGINEER
B. W. BEATTY
PROVINCE OF ONTARIO

Brian W. Beatty, P.Eng.

APPENDIX A

FIGURES



1/2 0 1/2 mile

SCALE 1:10,000

500 0 500 metres

LEGEND

- Property Boundary
- Ultimate Landfill Limits
- BH 12 ● Groundwater Monitor (borehole)
- GM 4 ▼ Gas Monitor
- MH 3 ■ Man Hole
- * Surface water sample point

REGION OF HAMILTON - WENTWORTH

GLANBROOK LANDFILL SITE

ANNUAL MONITORING REPORT

AIR PHOTO LOCATION

PROJECT NO. 386-831 | FEB. 1984

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1

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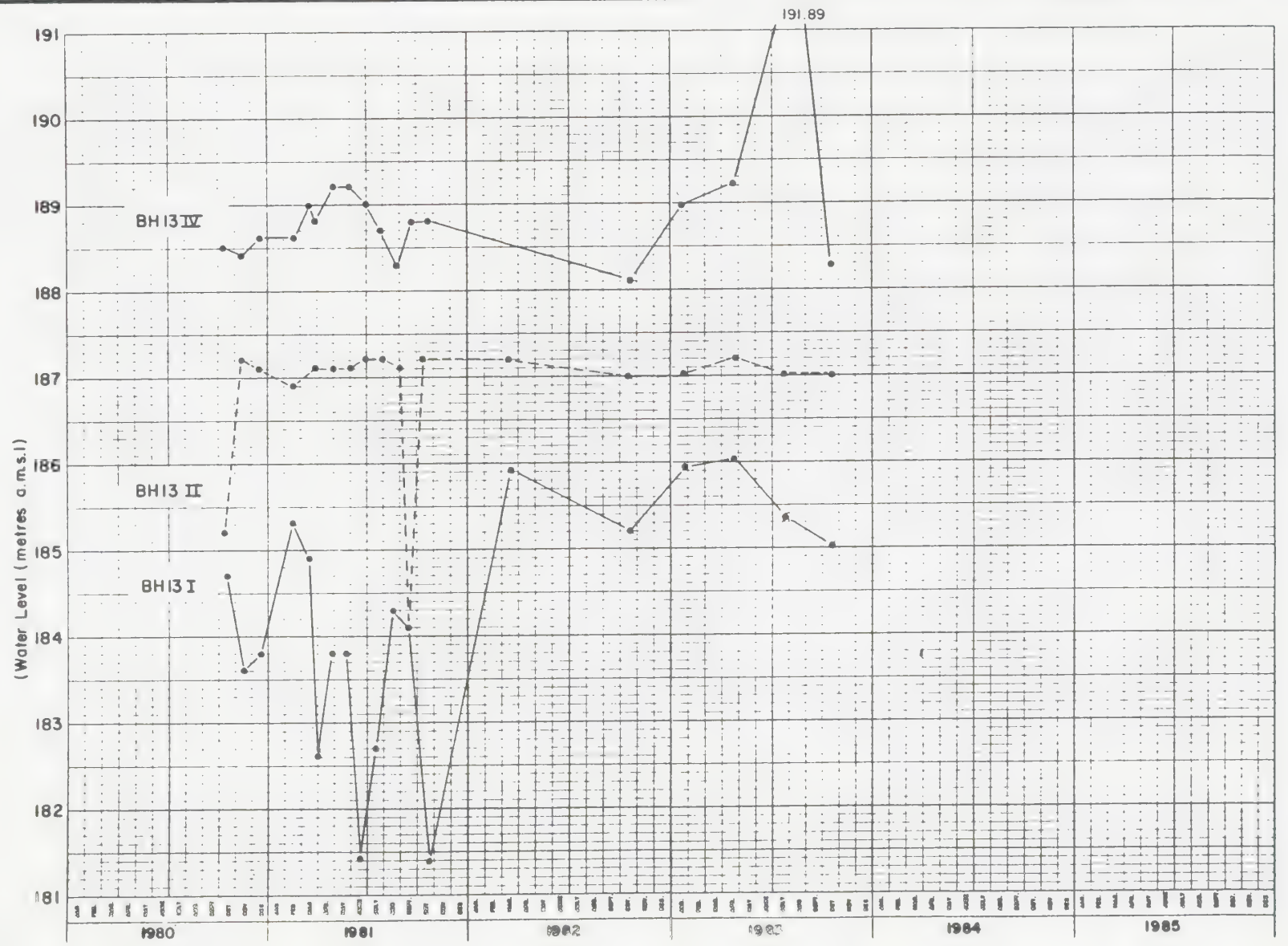
REGION OF HAMILTON - WENTWORTH
GLANBROOK LANDFILL SITE

Hydrograph for well nest BH13

2



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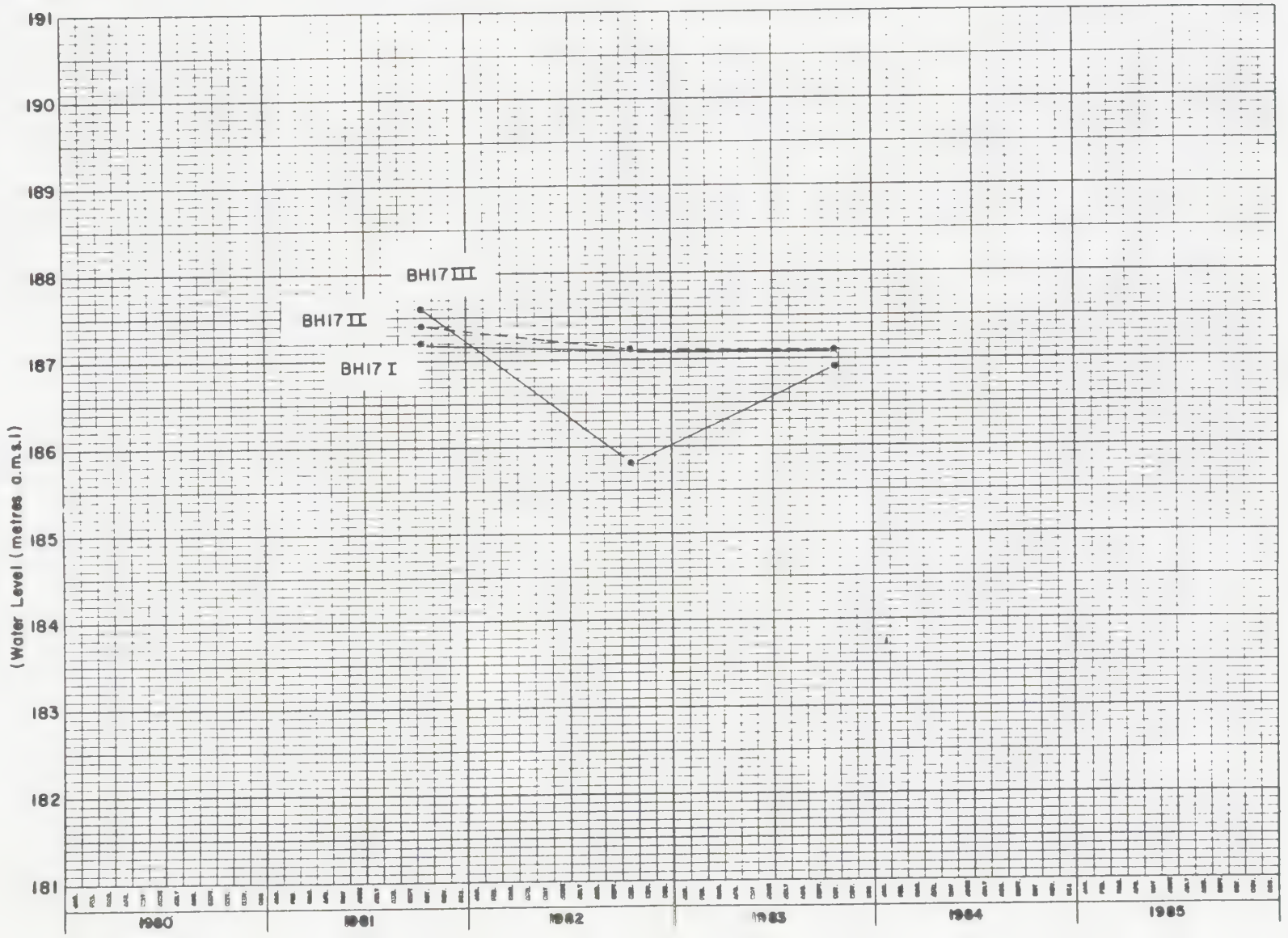
GLANBROOK LANDFILL SITE

Hydrograph for well nest BH17

3



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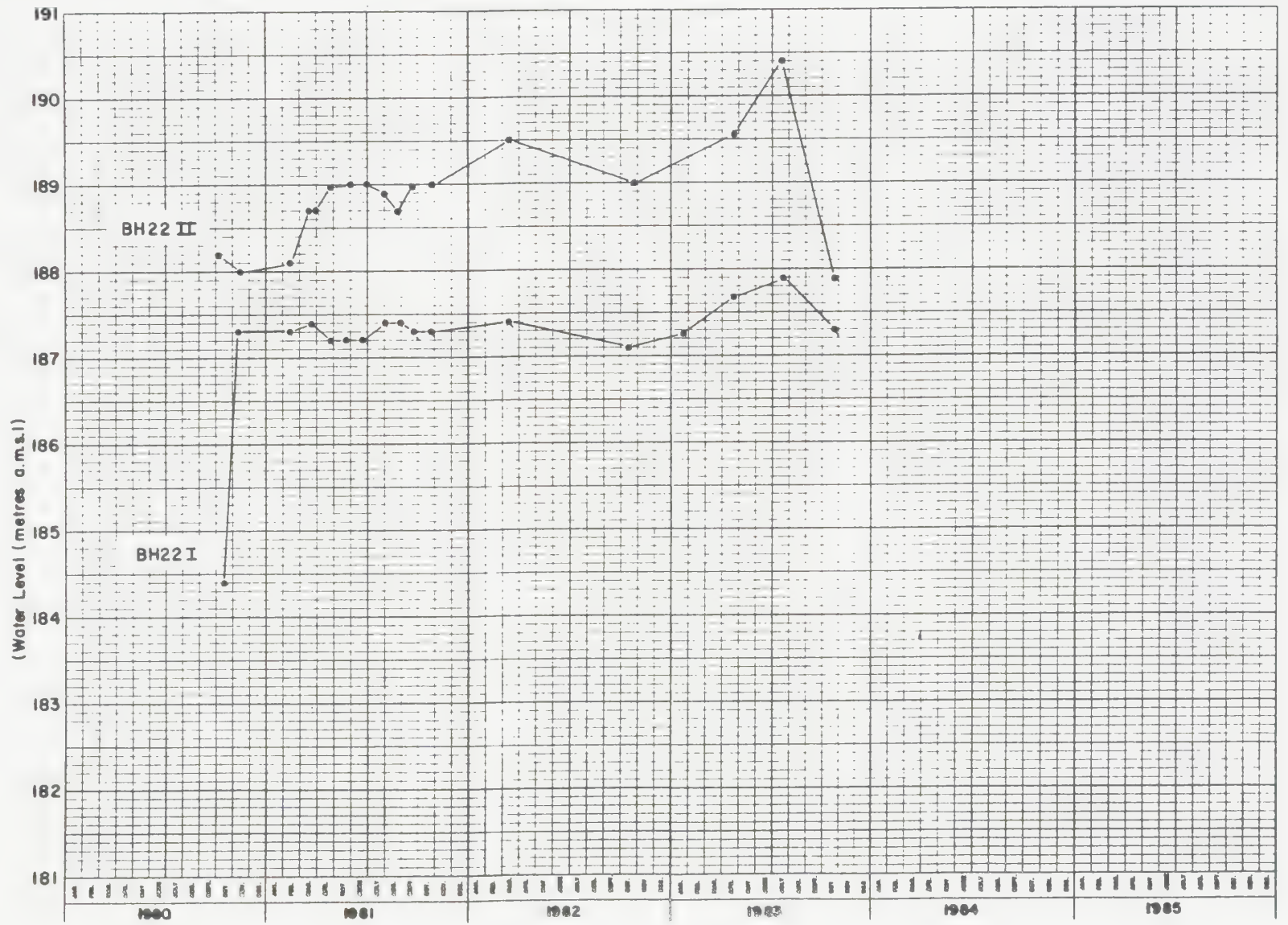
REGION OF HAMILTON - WENTWORTH
GLANBROOK LANDFILL SITE

Hydrograph for well nest BH22



APPENDIX B

TABLES

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE

TABLE 1A: WATER LEVEL DATA

WELL NUMBER	Depth metres	Ground Level mamsl		DATE D/M/YR																	
				27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	28/04	20/05	25/06	29/07	26/08	29/09	15/10 1981	25/03 1982	22/10	28/01 1983	26/04	28/07
1a - I	19.5	191.19														187.6		187.0			
II	10.5	191.9														188.0		187.6			
III	6.1	191.9														190.4		189.9			
5 - I	11.7	189.88														186.7		184.7			
II	8.8	189.88														189.6		185.9			
III	7.0	189.88														188.9		188.3			
12 - I	14.3	191.47														187.1		187.0			
II	10.8	191.50														187.3		186.7			
III	6.1	191.50														187.8		185.8			
13 - I	18.7	189.72		184.7	183.6	183.8	185.3	184.9	182.6	183.8	183.8	181.4	182.7	184.3	184.1	181.4	185.9	185.2	185.94	186.01	185.34
II	12.2	189.72		185.2	187.2	187.1	186.9	—	187.1	187.1	187.1	187.2	187.2	187.1	184.1	187.2	187.2	187.0	187.00	187.22	187.01
III	10.1	189.72																187.0	187.03	187.23	187.01
IV	5.2	189.88		188.5	188.4	188.6	188.6	189.0	188.8	189.2	189.2	189.0	188.7	188.3	188.8	188.8	—	188.1	188.97	189.25	191.89
14 - I	19.7	194.11		185.3	185.8	185.6	185.6	186.0	185.9	185.8	185.8	186.2	185.8	185.8	185.7	185.9	185.9	185.5			
II	15.2	194.11		187.5	187.8	187.8	187.7	188.0	187.9	187.8	187.8	188.0	188.0	188.6	188.0	187.8	188.2	188.0			
III	9.1	194.30		190.5	190.5	190.7	189.6	191.0	190.9	191.2	191.2	191.3	190.9	191.1	191.3	191.4	191.6	190.5			
17 - I	9.6	188.60														187.2		187.1			
II	8.7	188.60														187.3		187.1			
III	5.3	188.60														187.6		185.8			
22 - I	10.7	190.75		185.4	187.3	—	187.3	187.4	187.2	187.2	187.2	187.4	187.4	187.2	187.3	187.3	187.4	187.1	—	189.58	190.45
II	5.8	190.75		188.2	188.0	—	188.1	188.7	188.7	189.0	189.0	189.0	188.9	188.7	189.0	189.0	189.5	189.0	187.26	187.69	188.99
24 - I	12.2	189.36		185.0	186.9	186.9	186.8	187.0	186.9	186.9	186.8	186.8	186.9	186.9	186.9	186.8	187.0	186.7	186.93	186.98	186.73
II	7.0	189.36		187.6	187.7	187.5	187.5	188.0	187.7	187.8	187.7	187.8	188.0	187.4	187.7	187.6	188.0	187.5	187.63	187.73	187.09
III	3.7	189.36		187.6	187.7	187.5	187.5	188.0	187.7	187.8	187.7	187.8	188.0	187.5	187.7	187.6	188.0	187.5	187.63	187.75	187.08
25 - I	15.2	193.17		185.1	187.0	186.9	186.8	187.0	186.8	186.9	186.9	187.0	186.9	186.9	187.0	186.9	187.1	186.8	186.82	187.00	186.81
II	7.3	193.17		188.5	188.6	188.7	188.7	189.2	189.1	189.3	189.4	189.4	189.4	189.4	189.5	189.5	189.9	189.5	190.01	190.30	189.75
III	4.3	193.17		189.7	189.6	190.0	189.7	-	191.3	192.2	192.3	191.7	191.7	190.7	191.6	191.8	192.2	190.5	192.03	192.22	191.07
25a - I	7.3	193.11		188.4	188.6	188.8	188.7	188.9	189.2	189.3	189.5	189.5	189.5	189.4	188.0	—	190.0	189.5	189.88	190.30	189.82

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE

TABLE 1B: WATER LEVEL DATA

Well No.	Depth metres	Ground Level mamsl. #		DATE D/M/YR 31/10 1983																	
1a - I	19.5	191.19		187.02																	
II	10.5	191.19		187.40																	
III	6.1	191.19		189.73																	
5 - I	11.7	189.88		186.71																	
II	8.8	189.88		186.50																	
III	7.0	189.88		188.44																	
12 - I	14.3	191.47		187.06																	
II	10.8	191.50		186.73																	
III	6.1	191.50		185.74																	
13 - I	18.7	189.72		185.04																	
II	12.2	189.72		187.00																	
III	10.1	189.72		187.01																	
IV	5.2	189.88		188.29																	
14 - I	19.7	194.12		185.65																	
II	15.2	194.12		188.11																	
III	9.1	194.36		191.03																	
17 - I	9.6	188.60		187.16																	
II	8.7	188.60		187.15																	
III	5.3	188.60		186.92																	
22 - I	10.7	190.75		187.33																	
II	5.8	190.75		188.90																	
24 - I	12.2	189.36		186.78																	
II	7.0	189.36		187.79																	
III	3.7	189.36		187.79																	
25 - I	15.2	193.17		186.89																	
II	7.3	193.17		188.30																	
III	4.3	193.17		191.37																	
25a - I	7.3	193.11		188.27																	

1983

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE

TABLE 2A: WATER LEVEL DATA

Manhole No.	Depth metres	Ground Level mamsl.		DATE D/M/YR																	
				28/04 1981	20/05	25/06	29/07	26/08	29/09 1981	22/10 1982	26/04 1983	28/07	31/10								
MH-1		193.48		188.6	1886	-	1888	188.8	188.8	188.8	188.2	188.44	188.15								
MH-2											186.12		188.16								
MH-3		192.07		188.7	188.7	-	188.8	188.8	188.9	189.0											
MH-4		191.17		188.7	188.7	-	188.9	188.9	188.9	189.0	189.35	189.17	187.86								
MH-5		192.01									189.3	189.11	187.81								
MH-6		192.78									189.32	189.16	187.85								
MH-7		193.48									189.25	189.08	187.81								

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 3 : MANHOLE 1

Constituent mg/L	DATE D/M/YR																			
	29/04 1981	22/05	25/06	29/07	27/08	29/09 1981	25/03 1982	19/10	28/01 1983	26/04	28/07	31/10								
Conductance	2600	2250	1900	—	—	4000	230	2900	1800	4900	6000	800								
pH	6.8	7.2	7.0	—	—	7.1	7.5	7.6	6.9	7.0	6.9	6.1								
Chloride	99	45	45	—	—	61	8	0.7	37.5	310	285	900								
Hardness								2270												
Sulphate								1400												
Kjeldahl N								4.32												
Nitrate								0												
Phenol								0												
BOD																				
COD								29												
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium								0.04												
Copper								0.02												
Iron								3.4												
Lead																				
Manganese																				
Nickel								0.04												
Zinc								0.52												

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 4 : MANHOLE 2

Constituent mg/L	DATE D/M/YR																			
	19/10 1982	31/10 1983																		
Conductance	2900	6000																		
pH	7.5	6.95																		
Chloride	0.7	225																		
Hardness	2093																			
Sulphate	1540																			
Kjeldahl N	1.32																			
Nitrate	0.01																			
Phenol	0																			
BOD																				
COD	44																			
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	N.D																			
Copper	0.01																			
Iron	1.79																			
Lead																				
Manganese																				
Nickel	0.02																			
Zinc	0.03																			

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 5 : MANHOLE 3

Constituent mg/L	DATE D/M/YR																			
	29/04 1981	22/05	25/06	29/07	27/08	29/09 1981	25/03 1982	19/10	31/10 1983											
Conductance	2050	2500	2500	2600	2700	3000	1200	3300	2000											
pH	7.0	7.1	7.0	7.4	7.8	7.6	8.0	7.5	6.8											
Chloride	53	38	91	67	53	53	23	0.5	43.0											
Hardness								2335												
Sulphate								1720												
Kjeldahl N								8.32												
Nitrate								0.01												
Phenol								0												
BOD																				
COD								22												
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium								N.D.												
Copper								N.D.												
Iron								0.65												
Lead																				
Manganese																				
Nickel								0.03												
Zinc								0.02												

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 6 : MANHOLE 4

Constituent mg/L	DATE D/M/YR											
	29/04 1981	22/05	25/06	29/07	27/08	29/09 1981	25/03 1982	19/10	31/10 1983	26/04	28/07	31/10
Conductance	1850	2100	2900	2500	2600	3000	2700	3550	2100	3350	4000	3900
pH	7.2	7.1	7.0	7.2	7.5	7.3	7.3	7.4	6.8	6.9	6.7	5.5
Chloride	40	53	91	61	68	45	83	0.5	60.0	110.0	100	275
Hardness								2580				
Sulphate								1650				
Kjeldahl N								10.12				
Nitrate								0				
Phenol								0				
BOD												
COD								59				
TOC												
Sodium												
Potassium												
Calcium												
Magnesium												
Phosphorus P												
Cadmium												
Chromium								N.D.				
Copper								0				
Iron								1.10				
Lead												
Manganese												
Nickel								0.02				
Zinc								0.01				

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 6B: MANHOLE 6

Constituent mg/L	DATE D/M/YR 26/04 1993																			
Conductance	2700																			
pH	6.9																			
Chloride	57.0																			
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate																				
Phenol																				
BOD																				
COD																				
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 6c: MANHOLE 6

Constituent mg/L	DATE D/M/YR 26/04 1983																			
Conductance	2550																			
pH	7.0																			
Chloride	42.0																			
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate																				
Phenol																				
BOD																				
COD																				
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 6D: MANHOLE 7

Constituent mg/L	DATE D/M/YR																			
	26/04 1983																			
Conductance	2100																			
pH	7.0																			
Chloride	41.0																			
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate																				
Phenol																				
BOD																				
COD																				
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 7 : BH 1A-I

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
Conductance	3100 2900	2900	3050	2000																
pH	7.8 7.8	7.5	7.2	6.7																
Chloride	198 205	205	176	141																
Hardness	1680 1600	----	1800	1760																
Sulphate	1550 1530	—	1500	1350																
Kjeldahl N	0.55 0.69	----	0.56	0.0																
Nitrate	<0.05 <0.05	—	0.08	<.01																
Phenol	0.097 0.025	—	N.D.	.0012																
BOD	0.7 0.7			<1																
COD			22	<5																
TOC	1.0 1.0																			
Sodium	132 156																			
Potassium	6.7 6.8																			
Calcium	370 399																			
Magnesium	195 200																			
Phosphorus P																				
Cadmium	N.D. <0.01																			
Chromium	N.D. <0.02		0.09	<.10																
Copper	N.D. <0.05		0.02	<.05																
Iron	0.09 0.3		0.09	<.05																
Lead	0.1 <0.1																			
Manganese	<0.1 <0.1																			
Nickel	N.D. 0.05		0.05	<.02																
Zinc	0.1 <0.01		0.10	0.05																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 8 : BH 1A-II

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
Conductance	2900 2900	2750	2600	1800																
pH	7.9 7.9	7.5	7.5	7.0																
Chloride	260 262	235	200	148																
Hardness	1530 1690		1445	1440																
Sulphate	1270 1260		1150	1000																
Kjeldahl N	0.94 0.59		0.32	0.44																
Nitrate	<0.05 <0.05		0.67	0.1																
Phenol	0.013 0.027		N.D.	.0102																
BOD	0.7 4.7			<1																
COD			60	<5																
TOC	1.0 0.5																			
Sodium	129 142																			
Potassium	3.8 3.8																			
Calcium	287 301																			
Magnesium	203 206																			
Phosphorus P																				
Cadmium	N.D. <0.01																			
Chromium	N.D. <0.02		0.08	<.10																
Copper	N.D. <0.05		0.02	<.05																
Iron	0.07 1.34		0.79	0.11																
Lead	0.1 0.1																			
Manganese	0.1 <0.1																			
Nickel	N.D. <0.05		0.02	<.02																
Zinc	N.D. 0.01		<0.01	0.02																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 9 : BH 1A-III

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	8/10 1982	31/10 1983																
Conductance	2600 2500	2400		1700																
pH	7.6 7.6	7.5		6.8																
Chloride	110 112	99		100																
Hardness	1170 1270			1360																
Sulphate	920 1040			900																
Kjeldahl N	0.72 4.0			0.24																
Nitrate	<0.05 0.32			<.01																
Phenol	0.027			.0184																
BOD	2.6		D	6																
COD			A	15																
TOC	3.0 1.0		K																	
Sodium	153 162																			
Potassium	4.7 4.3																			
Calcium	231 252																			
Magnesium	168 175																			
Phosphorus P																				
Cadmium	N.D. <0.01																			
Chromium	N.D. <0.02			<.10																
Copper	N.D. <0.05			<.05																
Iron	0.23 3.12			0.22																
Lead	0.1 0.1																			
Manganese	0.8 0.75																			
Nickel	N.D. <0.05			<.02																
Zinc	N.D. <0.01		Y	0.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 10 : BH 5-1

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	13/10 1982	31/10 1983																
Conductance	2600 2080	2450	245	170																
pH	7.5 7.7	7.5	7.7	5.7																
Chloride	219 216	182	8	4.9																
Hardness	1200 1350		105	100																
Sulphate	1160 1210		13	27																
Kjeldahl N	0.36 0.40		0.56	0.12																
Nitrate	<0.05 –		1.10	0.8																
Phenol	0.035 0.028		N.D.	.0112																
BOD	0.5 0.3																			
COD			30	21																
TOC	1.5 1.5																			
Sodium	112 130																			
Potassium	3.7 3.5																			
Calcium	288 305																			
Magnesium	151 150																			
Phosphorus P																				
Cadmium	N.D. <0.01																			
Chromium	N.D. <0.02		0.04	<.10																
Copper	N.D <0.05		<0.01	<.05																
Iron	0.12 0.56		0.02	0.11																
Lead	0.1 <0.1																			
Manganese	1.1 1.45																			
Nickel	N.D. <0.05		<0.01	<.02																
Zinc	N.D. 0.03		<0.01	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 11 : BH 5-II

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
Conductance	1750 1690	900	600	330																
pH	7.9 7.9	7.0	8.0	7.1																
Chloride	94 130	53	28	12																
Hardness	750 750		316	240																
Sulphate	530 600		110	40																
Kjeldahl N	0.48 0.42		0.56	0.12																
Nitrate	<0.05 <0.05		1.06	1.3																
Phenol	0.015 0.024		N.D.	.0173																
BOD	- 36			11																
COD			73	51																
TOC	4.5 1.0																			
Sodium	118 116																			
Potassium	1.5 1.0																			
Calcium	120 131																			
Magnesium	114 116																			
Phosphorus P																				
Cadmium	N.D. <0.01																			
Chromium	N.D. <0.02		0.03	<.10																
Copper	N.D. <0.05		0.08	<.05																
Iron	0.12 1.55		0.30	0.05																
Lead	0.1 <0.1																			
Manganese	0.2 1.10																			
Nickel	N.D. <0.05		0.01	<.02																
Zinc	N.D. <0.01		0.01	0.02																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 12 : BH 5-III

Constituent mg/L	DATE D/M/YR																				
	PRE-DISPOSAL 1980	15/10 1981	13/10 1982	31/10 1983																	
Conductance	600 650	650	950	300																	
pH	7.9 8.2	7.5	7.5	7.1																	
Chloride	11 14	15	30	12																	
Hardness	320 350		545	240																	
Sulphate	160 150		225	30																	
Kjeldahl N	0.98 1.0		6.08	0.0																	
Nitrate	0.23 <0.05		0.06	2.5																	
Phenol	0.067 0.027		N.D.	.041																	
BOD	1.3 2.3			72																	
COD			88	15																	
TOC	4.0 3.0																				
Sodium	7.3 14.0																				
Potassium	1.3 1.6																				
Calcium	63 82																				
Magnesium	27 46																				
Phosphorus P																					
Cadmium	N.D. <0.01																				
Chromium	N.D. <0.02		0.04	<.10																	
Copper	N.D. <0.05		0.01	<.05																	
Iron	0.65 1.62		3.90	0.19																	
Lead	0.1 <0.1																				
Manganese	0.3 0.3																				
Nickel	N.D. <0.05		0.04	<.02																	
Zinc	N.D. <0.01		0.01	<.01																	

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 13 : BH 12-I

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
Conductance	3200 3150	2900	1250	1200																
pH	7.6 7.5	8.0	7.4	7.2																
Chloride	240 243	227	6	24																
Hardness	1720 1740		833	790																
Sulphate	1490 1610		530	500																
Kjeldahl N	0.38 0.42		0.56	0.12																
Nitrate	<0.05 <0.05		N.D.	0.2																
Phenol	0.007 0.021		N.D.	—																
BOD	7.7 7.5			38																
COD			22	<5																
TOC	2.0 <0.5																			
Sodium	139 156																			
Potassium	6.8 6.7																			
Calcium	410 424																			
Magnesium	160 166																			
Phosphorus P																				
Cadmium																				
Chromium			0.01	<.10																
Copper			0.09	<.05																
Iron	0.07 0.12		0.37	<.05																
Lead																				
Manganese																				
Nickel			0.01	<.02																
Zinc			0.01	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 14 : BH 12-II

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
Conductance	2900 2650	1750	1250	900																
pH	7.3 7.8	7.5	7.5	6.8																
Chloride	60 67	38	5	11																
Hardness	1820 1590		810	570																
Sulphate	1560 1450		50	270																
Kjeldahl N	0.46 0.33		0.32	0.0																
Nitrate	<0.05 <0.05		0.12	0.3																
Phenol	0.011 0.026		N.D.	.0714																
BOD	0.9 0.5			2																
COD			22	<5																
TOC	3.5 1.0																			
Sodium	77 88																			
Potassium	4.2 4.2																			
Calcium	274 200																			
Magnesium	278 249																			
Phosphorus P																				
Cadmium																				
Chromium			0.03	<.10																
Copper			0.05	<.05																
Iron	0.10 0.24		0.14	<.05																
Lead																				
Manganese																				
Nickel			<0.01	<.02																
Zinc			0.01	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 15 : BH 12-III

Constituent mg/L	DATE D/M/YR																					
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982																			
Conductance		5900	↓	↓																		
pH	8.3	7.5																				
Chloride		121																				
Hardness																						
Sulphate	4100																					
Kjeldahl N																						
Nitrate																						
Phenol																						
BOD				SAMPLE																		
COD																						
TOC			DUPLICATE																			
Sodium	294																					
Potassium	10.9																					
Calcium	133																					
Magnesium	995																					
Phosphorus P																						
Cadmium																						
Chromium																						
Copper																						
Iron	0.57																					
Lead																						
Manganese																						
Nickel																						
Zinc			↓	↓																		

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 16A: BH 13-I

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	1500 1600	–	2500	2500	2500	1800	2800	3000	2750	–	–	2600	2750	2900	2400	2700	–	2900	2750	1700
pH	8.0 7.1	8.0	7.7	7.8	7.9	8.6	8.3	8.3	8.2	–	–	8.3	7.9	7.5	7.3	6.7	–	7.1	6.7	7.2
Chloride	– 130	180	182	122	193	240	227	205	167	–	–	235	212	225	227	195	–	173	118	102
Hardness	– 450													700						229
Sulphate	560 540													1225						835
Kjeldahl N														3.4						1.52
Nitrate														0.02						0.13
Phenol														0.040						0
BOD														0.3						
COD																				22
TOC	6.0 2.5																			
Sodium	145 166													185						
Potassium	9.6 11.0													2.9						
Calcium	49 63													110						
Magnesium	79 81													190						
Phosphorus P														0.3						
Cadmium	N.D. –													N.D.						
Chromium	N.D. –													N.D.						0.12
Copper	N.D. –													N.D.						0.06
Iron	<0.1 –													0.5						0.23
Lead	0.2 –													N.D.						
Manganese	1.3 –													0.1						
Nickel	N.D. –													N.D.						0.01
Zinc	N.D. –													N.D.						0.04

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 16B: BH 13-I

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	2700	2800		2600																
pH	7.0	6.7		7.1																
Chloride	175	196		153																
Hardness	1657	1500		1550																
Sulphate	1525	1450		1450																
Kjeldahl N	1.02	2.0		2.32																
Nitrate	1.12	0.20		0.3																
Phenol	.090	.088		—																
BOD		1.2		32																
COD	51	13		<5																
TOC			W																	
Sodium			J																	
Potassium			P																	
Calcium			E																	
Magnesium			¢																	
Phosphorus P			ø																	
Cadmium																				
Chromium	0.13	<.10	0	<.10																
Copper	0.03	0.03	2	<.05																
Iron	0.42	0.57		<.05																
Lead																				
Manganese																				
Nickel	<.05	<.05		<.02																
Zinc	0.06	<.01		0.03																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 17B BH 13-II

Constituent mg/L	DATE D/M/YR																			
	28/01 1993	26/04	28/07	31/10																
Conductance	1600	1600	1980	1900																
pH	7.2	7.5	7.3	7.4																
Chloride	120	110	152	137																
Hardness	811	744	810	1120																
Sulphate	850	725	925	920																
Kjeldahl N	0.38	0.88	<.01	0.56																
Nitrate	0.08	0.02	0.02	0.1																
Phenol	0.0	.140	.0775	.255																
BOD		2.4	5	8																
COD	44	4.4	51.5	<5																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10	<.10	0.03	<.10																
Copper	0.01	0.01	—	<.05																
Iron	0.75	1.51	2.35	<.05																
Lead																				
Manganese																				
Nickel	<.05	<.05	—	<.02																
Zinc	0.05	<.01	0.03	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 18A: BH 13- IV

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	28/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	1700 2100	1900	2000	2000	1900	900	1800	1550	1700	2100	1500	1600	1700	1850	-	1600	1550	1700	1600	1450
pH	8.2 7.9	7.0	7.5	7.2	7.3	7.3	7.6	7.5	7.3	7.6	7.6	7.4	7.6	7.2	-	6.6	7.1	6.9	6.9	7.7
Chloride	34 87	45	61	45	47	60	38	40	38	40	38	38	38	50	-	3	7	28	33	26
Hardness	806 1020													575						985
Sulphate	700 780													800						555
Kjeldahl N														0.5						2.08
Nitrate	<0.05 -													0.02						0.07
Phenol														0.134						0
BOD														0						
COD																				73
TOC	2.0 0.5																			
Sodium	144 59													75						
Potassium	2.7 2.9													3.3						
Calcium	237 152													165						
Magnesium	150 340													175						
Phosphorus P														3.12						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.08
Copper	N.D <0.05													N.D.						0.02
Iron	0.1 <0.05													2.4						2.2
Lead	0.2 <0.1													N.D.						
Manganese	0.1 1.00													1.2						
Nickel	N.D. <0.05													N.D.						0.01
Zinc	N.D. <0.01													0.03						0.02

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 18B BH 13-IV

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	1600	1700	1720	1500																
pH	7.1	7.3	7.2	7.0																
Chloride	30	-	29	26																
Hardness	1081	1050	1160	1050																
Sulphate	650	810	610	630																
Kjeldahl N	1.82	2.2	0.74	0.92																
Nitrate	<0.01	0.01	<.01	0.1																
Phenol	0.0	.123	.1142	.306																
BOD		4.9	3	43																
COD	44	14.7	<1.0	22																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10	<.10	0.05	<.10																
Copper	0.80	0.02	0.05	<.05																
Iron	2.95	1.92	2.67	0.10																
Lead																				
Manganese																				
Nickel	<.05	<.05	0.02	<.02																
Zinc	0.04	0.06	0.01	<.02																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 19A: BH 14-I

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	23/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	2900 2580	3100	3100	3800	3500	2400	2900	3000	3500	2700	2800	2800	2900	3000	2500	2780	2700	3100	3020	2900
pH	7.8 7.4	7.5	7.5	7.4	7.4	7.6	7.3	7.7	7.7	7.5	7.7	7.8	7.7	7.2	7.3	6.8	7.3	7.0	6.8	7.6
Chloride	220 201	255	242	242	244	300	227	243	227	336	281	303	258	235	265	226	220	215	218	217
Hardness	1460 1340													825						1702
Sulphate	1310 1190													1500						1530
Kjeldahl N	1.1 1.4													1.6						1.28
Nitrate	<0.05 <0.05													0						0.24
Phenol	0.004 0.034													0.211						0
BOD	15 27													0.1						
COD																				30
TOC	3.5 2.0																			
Sodium	164 127													150						
Potassium	8.0 10.5													3.5						
Calcium	200 291													410						
Magnesium	136 146													140						
Phosphorus P														0.12						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						<0.02
Copper	N.D. <0.05													N.D.						0.52
Iron	0.1 0.1													0.4						0.17
Lead	0.2 <0.1													N.D.						
Manganese	0.1 0.1													<0.1						
Nickel	N.D. 0.05													N.D.						0.18
Zinc	N.D. <0.01													N.D.						0.02

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 19B: BH 14-I

Constituent mg/L	DATE D/M/YR 31/10 1983																			
Conductance	2200																			
pH	6.8																			
Chloride	230																			
Hardness	1690																			
Sulphate	1400																			
Kjeldahl N	0.44																			
Nitrate	<.01																			
Phenol	.082																			
BOD	12																			
COD	51																			
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10																			
Copper	<.05																			
Iron	0.26																			
Lead																				
Manganese																				
Nickel	<.02																			
Zinc	0.02																			

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 20A: BH 14-II

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	2800 3830	3000	2600	3580	3000	2200	2200	2600	2800	-	2750	2200	2500	2500	2100	2600	-	-	2450	
pH	7.5 7.4	7.5	7.3	7.4	7.4	7.7	7.4	7.7	7.7	-	7.8	7.5	7.6	7.2	6.8	6.9	-	-	6.8	
Chloride	160 184	180	212	212	176	240	174	182	152	-	205	190	174	170	167	147	-	-	139	
Hardness	1500 1550													675						
Sulphate	1570 1440													1350						
Kjeldahl N	0.64 0.14													1.2						
Nitrate	0.19 <0.05													0.11						
Phenol														0.086						
BOD														0.2						
COD																				
TOC	3.9 2.5																			
Sodium	337 140													155						
Potassium	4.8 2.6													3.1						
Calcium	117 283													300						
Magnesium	213 305													140						
Phosphorus P														0.3						
Cadmium	N.D.													N.D.						
Chromium	N.D.													N.D.						
Copper	N.D.													N.D.						
Iron	0.1													0.3						
Lead	0.1													N.D.						
Manganese	0.3													0.3						
Nickel	N.D.													N.D.						
Zinc	N.D.													0.03						

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 20B: BH 14-II

Constituent mg/L	DATE D/M/YR																			
	31/10 1993																			
Conductance																				
pH																				
Chloride																				
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate																				
Phenol																				
BOD																				
COD																				
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 21A: BH 14-III

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/08	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	6500 6300	7000	9000	7000	6500	6000	6000	5500	7000	5200	5500	4750	6000	6000	3750	5500	4500	6000	2950	
pH	7.5 7.7	7.5	7.0	7.5	7.0	7.1	7.1	7.2	7.1	7.5	7.4	7.4	7.3	6.6	7.3	6.9	7.2	6.8	6.7	
Chloride	240 231	240	212	227	229	270	227	243	178	305	243	258	212	135	220	38	10	24	171	
Hardness	4150 4410													1885						
Sulphate	4075 4130													2750						
Kjeldahl N	0.58 0.44													0.8						
Nitrate	0.15 0.09													0.04						
Phenol	0.044 0.045													0.205						
BOD	– 1.0													0.2						
COD																				
TOC	2.5 1.0																			
Sodium	343 364													430						
Potassium	11.6 12.4													3.7						
Calcium	474 533													515						
Magnesium	805 845													700						
Phosphorus P														0.10						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.01													N.D.						
Copper	N.D. <0.05													N.D.						
Iron	6.5 0.10													5.4						
Lead	0.3 <0.10													N.D.						
Manganese	0.6 0.55													0.7						
Nickel	N.D. 0.10													N.D.						
Zinc	<0.1 0.02													0.03						

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 21B: BH 14-III

Constituent mg/L	DATE D/M/YR 31/10 1983																			
Conductance	3600																			
pH	6.9																			
Chloride	141																			
Hardness	3100																			
Sulphate	2850																			
Kjeldahl N	0.24																			
Nitrate	0.1																			
Phenol	.367																			
BOD	10																			
COD	18																			
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10																			
Copper	<.05																			
Iron	0.23																			
Lead																				
Manganese																				
Nickel	<.02																			
Zinc	0.03																			

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 22 : BH 17-I

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	18/10 1982	31/10 1983																
Conductance	3200 3100	2700	2600	1600																
pH	7.7 7.8	7.5	7.6	7.0																
Chloride	256 260	174	171	118																
Hardness	1600 1690		1390	1140																
Sulphate	1510 1540		1285	925																
Kjeldahl N	0.43 1.1		N.D.	0.0																
Nitrate	<0.05 <0.05		0.08	0.7																
Phenol	0.0065 0.022		N.D.	—																
BOD	1.8 0.8			<1																
COD			60	7																
TOC	1.0 <0.5																			
Sodium	348 170																			
Potassium	5.2 5.0																			
Calcium	495 391																			
Magnesium	166 168																			
Phosphorus P																				
Cadmium																				
Chromium			<0.01	<.10																
Copper			0.03	<.05																
Iron	0.08 0.74		0.07	0.14																
Lead																				
Manganese																				
Nickel			0.02	<.02																
Zinc			0.02	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 23 : BH 17-II

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	15/10 1981	19/10 1982	31/10 1983																
ductance	3100 2830	2300	2250	1400																
	8.0 7.8	8.0	7.7	7.6																
oride	190 186	121	100	65																
dness	720 930		795	650																
phate	1100 1190		985	725																
ldahl N	40 18		0.53	3.24																
rate	0.14 <0.05		0.16	0.3																
nol	0.044 0.027		N.D.	.0204																
	15 7.3			<1																
			45	19																
	2.5 0.5																			
ium	140 278																			
assium	35 17																			
cium	269 216																			
nesium	76 104																			
sphorus P																				
nium																				
omium			<0.01	<.10																
per			0.03	<.05																
n	0.14 0.18		0.16	<.05																
i																				
ganese																				
cel			0.01	<.02																
:			0.01	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 25A: BH 22-I

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
nductance	2900 2680	2500	3000	-	2250	2800	2700	2100	2500	2400	2000	2400	3000	2900	2050	3200	3200	5500	850	600
	7.7 7.7	8.0	7.5	-	7.4	7.6	7.3	7.4	7.0	7.2	7.3	7.1	7.4	7.1	7.5	6.8	7.1	7.2	7.2	7.7
loride	260 205	150	217	-	186	240	159	152	167	380	243	281	243	260	258	112	10	81	112	63
rdness	1400 1405													790						2250
phate	1420 1310													1450						120
eldahl N	0.62 0.70													1.8						0.24
trate	<0.05 0.15													0.08						0.75
enol	0.0074 0.030													0.0026						0
	1.7 0.5													0						
																				—
	2.0 <0.5																			
lium	4.8 12.3													170						
assium	5.3 3.8													4.1						
cium	132 297													400						
gnesium	155 159													135						
sphorus P														0.08						
mium	N.D. <0.01													N.D.						
omium	N.D. <0.03													N.D.						0.06
per	N.D. <0.05													N.D						<0.01
n	0.4 0.15													0.6						0.24
d	0.1 <0.10													N.D.						
ganese	0.4 0.20													0.3						
kel	N.D. <0.05													N.D.						0.13
c	N.D. <0.01													0.04						<0.01

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 25B: BH 22-I

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance		1350		900																
pH		7.5		7.2																
Chloride		–		69																
Hardness		750		600																
Sulphate		670		365																
Kjeldahl N		4.8		2.08																
Nitrate		0.07		0.7																
Phenol		–		.102																
BOD		–		8																
COD	2	176		75																
TOC	E		E																	
Sodium	N		J																	
Potassium	O		P																	
Calcium	R		E																	
Magnesium	F		A																	
Phosphorus P			S																	
Cadmium																				
Chromium		<.10		<.10																
Copper		0.07	O	<.05																
Iron		32.0	F	0.13																
Lead																				
Manganese																				
Nickel		<.05		<.02																
Zinc		0.42		0.07																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 26A: BH 22-II

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	5650 –	6000	7000	–	2000	5000	5000	5000	6000	4300	4250	4500	6500	5000	3600	2350	7200	5200	700	850
pH	7.3 –	7.0	7.5	–	7.2	7.1	7.0	8.0	8.2	8.0	8.0	7.8	7.2	6.6	7.0	6.6	7.6	7.2	7.3	7.5
Chloride	129 136	150	121	–	69	180	98	121	129	765	121	144	129	130	129	135	127	143	108	68
Hardness	3900 4160													2150						460
Sulphate	4350 –													2750						280
Kjeldahl N	0.13 0.55													1.4						8.0
Nitrate	<0.05 –													0.06						0.75
Phenol	0.014 0.028													0.013						0
BOD														0.5						
COD																				191
TOC	4.0 <0.5																			
Sodium	279 253													290						
Potassium	7.2 7.3													3.5						
Calcium	486 459													500						
Magnesium	707 788													820						
Phosphorus P														1.12						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.10
Copper	N.D. <0.05													<0.1						0.09
Iron	3.0 0.15													3.3						34.0
Lead	0.2 <0.10													1.5						
Manganese	3.0 0.15													3.4						
Nickel	<0.1 0.10													N.D.						0.09
Zinc	0.1 <0.01													0.6						0.20

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 26B: BH 22-II

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	290	I.S		900																
pH	7.4	7.8		6.9																
Chloride	30	I.S		90																
Hardness	142	I.S		590																
Sulphate	62	I.S		334																
Kjeldahl N	<0.10	I.S		2.0																
Nitrate	1.11	I.S		—																
Phenol	0.0	I.S		—																
BOD				8																
COD	51	I.S	W	118																
TOC			J																	
Sodium			D																	
Potassium			E																	
Calcium			C																	
Magnesium			S																	
Phosphorus P																				
Cadmium																				
Chromium	<.10	<.10	O	<.10																
Copper	0.02	0.10	Z	<.05																
Iron	1.00	15.4		<.05																
Lead																				
Manganese																				
Nickel	<.05	<.05		<.02																
Zinc	<.01	0.20		0.11																

I.S. – insufficient sample

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 27A: BH 24-I

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	13/10 1982
Conductance	3200 3170	3500	3600	4000	3750	3300	3200	3000	3500	2600	2600	2600	3500	3100	2300	2610	2500	2900	2800	2950
pH	7.7 7.7	7.5	7.7	7.5	7.5	7.6	7.8	7.6	7.1	7.5	8.0	7.3	7.4	7.3	7.7	6.9	7.5	7.4	7.0	7.3
Chloride	247 549	300	273	280	227	270	182	280	243	330	296	303	258	275	281	238	237	215	241	230
Hardness	1600 1630													830						1209
Sulphate	1700 1800													1550						1430
Kjeldahl N	0.17 0.51													1.2						1.40
Nitrate	0.62 <0.1													0.03						0
Phenol	0.034 0.022													0.012						0
BOD	38 10													3.0						
COD																				—
TOC	4.0 5.4																			
Sodium	146 130													165						
Potassium	18.6 8.4													4.1						
Calcium	315 342													435						
Magnesium	208 188													155						
Phosphorus P														0.20						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.02
Copper	N.D. <0.05													—						0.09
Iron	0.1 0.1													0.3						0.30
Lead	0.1 0.1													0.3						
Manganese	0.1 <0.10													0.1						
Nickel	N.D. 0.05													N.D.						0.03
Zinc	N.D. 0.02													N.D.						0.01

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 27B: BH 24-I

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	2700	2800	2940	2100																
pH	6.9	7.2	7.25	7.3																
Chloride	220	230	245	235																
Hardness	1918	1650	1550	1620																
Sulphate	1425	1175	1675	1350																
Kjeldahl N	0.10	0.32	0.14	1.28																
Nitrate	<0.01	0.01	<.01	1.2																
Phenol	0.0	–	.897	.143																
BOD		–	1	<1																
COD	29	67	43	<5																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10	<.10	0.06	<.10																
Copper	0.13	<.01	0.09	<.05																
Iron	0.59	4.8	0.98	<.05																
Lead																				
Manganese																				
Nickel	<.05	<.05	0.04	<.02																
Zinc	0.02	0.02	–	<.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 28A: BH 24-II

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	15/10 1982
Conductance	4300 4500	5000	5200	6000	5000	3800	4000	3400	5000	3300	3500	3250	4300	2900	2600	3120	3100	3500	3520	3450
pH	7.4 7.4	7.0	7.5	7.2	7.2	7.2	7.5	7.3	7.0	7.5	7.5	7.2	7.3	6.7	7.3	6.9	7.3	6.9	6.9	7.7
Chloride	123 78	75	91	83	84	120	61	68	61	92	68	67	53	58	45	7	8	37	58	53
Hardness	2000 2370													1305						2252
Sulphate	2900 3000													2300						1945
Kjeldahl N	0.75 0.63													0						1.28
Nitrate	1.6 <0.1													0.06						0
Phenol	0.034 0.024													0						0
BOD	30 23													0						
COD																				15
TOC	2.0 12																			
Sodium	360 260													150						
Potassium	29 15.4													3.5						
Calcium	445 435													410						
Magnesium	268 277													400						
Phosphorus P														0.02						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.15
Copper	N.D. <0.05													N.D.						0.72
Iron	12.0 6.0													10.5						5.0
Lead	0.2 <0.10													N.D.						
Manganese	0.6 0.5													0.5						
Nickel	<0.1 0.5													N.D.						0.06
Zinc	0.1 0.04													N.D.						0.05

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 28B: BH 24-II

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	3300	3200	3380	2100																
pH	7.0	7.0	6.9	6.9																
Chloride	40	43.0	40	39																
Hardness	2507	2250	2320	2170																
Sulphate	2150	1750	2150	1870																
Kjeldahl N	0.44	0.52	1.0	1.16																
Nitrate	<0.01	0.02	<.01	<.01																
Phenol	0.0	.035	.0163	-																
BOD		-	1	8																
COD	15	14.7	<1.0	<5																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	<.10	<.10	0.02	<.10																
Copper	0.06	0.06	0.04	<.05																
Iron	5.86	14.9	10.7	0.45																
Lead																				
Manganese																				
Nickel	<.05	<.05	0.01	<.02																
Zinc	0.10	<.01	0.04	0.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 29A: BH 24-III

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	4300 4050	4500	5000	6000	4000	3800	3500	3250	3600	3000	3000	3000	4000	3350	2500	3260	3000	3820	3680	3200
pH	7.4 7.6	7.0	7.0	7.1	7.2	7.1	7.4	7.3	7.1	7.0	7.2	7.3	7.3	6.7	7.3	6.9	7.2	6.8	6.9	7.6
Chloride	38 1045	45	61	53	49	90	40	40	38	61	45	45	38	35	45	5	8	37	40	21
Hardness	2800 2450													1150						2275
Sulphate	3300 2800													1950						1945
Kjeldahl N	0.41 0.22													0.80						2.08
Nitrate	0.18 0.15													0.35						0.55
Phenol	0.024 0.022													0						0
BOD	24 2.8													0						
COD																				14
TOC	4.0 7.9																			
Sodium	214 144													120						
Potassium	16.9 7.1													3.7						
Calcium	443 444													255						
Magnesium	440 437													380						
Phosphorus P														0.10						
Cadmium														N.D.						
Chromium														N.D.						0.02
Copper														N.D.						0.05
Iron														3.7						2.7
Lead														N.D.						
Manganese														0.5						
Nickel														N.D.						<0.01
Zinc														N.D.						<0.01

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 29B: BH 24-III

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	2700	2650	2820	2000																
pH	7.0	7.0	6.95	6.9																
Chloride	25	4.5	2.5	23																
Hardness	2180	1840	1930	1850																
Sulphate	1700	1475	1765	1420																
Kjeldahl N	0.26	0.16	0.14	1.40																
Nitrate	0.63	0.22	<.01	0.1																
Phenol	0.0	.026	.0122	—																
BOD		—	14	20																
COD	15	11.8	2.9	<5																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	0.10	<.10	0.08	<.10																
Copper	0.02	0.04	0.04	<.05																
Iron	3.01	3.1	3.5	<.05																
Lead																				
Manganese																				
Nickel	<.05	<.05	0.03	<.02																
Zinc	0.02	<.01	0.05	0.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 30A: BH 25-I

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	2900 2850	3100	3400	3500	3000	1900	2800	2700	2600	2500	2300	2300	2750	2100	2050	2370	2250	2600	2680	2750
pH	7.6 7.5	7.5	7.7	7.3	7.6	7.4	7.9	7.8	7.5	7.6	7.4	7.5	7.5	7.2	7.8	6.4	7.5	7.1	7.2	7.7
Chloride	147 149	180	182	174	152	210	175	197	152	180	190	205	167	190	159	145	138	142	141	142
Hardness	1900 1570													735						1581
Sulphate	1900 1700													1450						1285
Kjeldahl N	0.68 0.47													1.6						1.04
Nitrate	0.19 <0.1													0.02						0.05
Phenol	0.039 0.025													0.049						0
BOD	107 5.3													0.1						
COD																				22
TOC	4.0 4.0																			
Sodium	134 120													150						
Potassium	9.0 4.6													3.5						
Calcium	268 329													310						
Magnesium	157 174													155						
Phosphorus P														0.08						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.08
Copper	N.D. <0.05													N.D.						0.34
Iron	0.8 <0.05													0.5						0.58
Lead	0.1 0.20													N.D.						
Manganese	0.1 <0.10													<0.1						
Nickel	N.D. <0.05													N.D.						0.03
Zinc	<0.1 <0.01													0.02						0.01

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 30B: BH 25-I

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	↑	2450	2650	2300																
pH	↕	7.25	7.25	7.2																
Chloride	↕	152.0	156.0	144																
Hardness	↕	1270	1330	1380																
Sulphate	↓	1150	1352	1280																
Kjeldahl N		0.92	0.50	0.92																
Nitrate		0.01	<.01	0.1																
Phenol		—	.049	.265																
BOD		0.4	1	20																
COD		7.4	2.9	12																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium		<.10	0.06	<.10																
Copper		0.01	0.05	<.05																
Iron		1.1	2.1	<.05																
Lead																				
Manganese																				
Nickel		<.05	0.02	<.02																
Zinc	↓	<.01	0.02	0.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 31A: BH 25-II

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	25/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	2900 4700	5800	6000	6000	6000	1000	5500	5000	6000	5000	5500	4750	6500	6000	4000	6000	4500	6500	6500	6000
pH	7.6 7.9	7.0	7.0	7.2	7.1	6.8	7.4	7.3	7.0	7.3	7.1	7.1	7.2	6.5	7.0	6.6	7.1	6.8	6.8	7.4
Chloride	143 143	113	152	121	98	150	106	106	98	120	106	106	83	80	91	30	10	21	15	3
Hardness	1500 2840													2350						5460
Sulphate	1600 3200													3250						4585
Kjeldahl N	0.95 0.47													0.8						1.28
Nitrate	<0.1 <0.1													0.02						0.22
Phenol	0.024 0.024													0.059						0
BOD	- 5.2													0						
COD																				441
TOC	2.5 5.2																			
Sodium	148 164													255						
Potassium	9.5 9.0													3.3						
Calcium	294 355													475						
Magnesium	19.8 565													970						
Phosphorus P														0.42						
Cadmium	N.D. <0.01													N.D.						
Chromium	N.D. <0.02													N.D.						0.11
Copper	N.D. <0.05													N.D.						0.66
Iron	<0.1 0.10													0.6						2.2
Lead	0.2 <0.10													N.D.						
Manganese	2.2 2.3													2.5						
Nickel	0.1 0.13													N.D.						0.07
Zinc	<0.1 0.01													N.D.						0.16

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 31B: BH 25-II

Constituent mg/L	DATE D/M/YR																		
	28/01 1983	26/04	28/07	31/10															
Conductance	6000	3250	3850	4000															
pH	6.7	7.1	7.0	6.9															
Chloride	65	5.9	1.5	32															
Hardness	5640	3100	2900	3420															
Sulphate	5100	2300	1600	2820															
Kjeldahl N	0.46	–	0.29	0.32															
Nitrate	0.11	0.30	0.04	0.2															
Phenol	0.0	.090	.0939	.082															
BOD		–	2.0	<1															
COD	29	7.4	<1.0	12															
TOC																			
Sodium																			
Potassium																			
Calcium																			
Magnesium																			
Phosphorus P																			
Cadmium																			
Chromium	0.20	<.10	0.04	<.10															
Copper	0.13	0.01	0.07	<0.5															
Iron	0.64	0.35	3.7	<.05															
Lead																			
Manganese																			
Nickel	0.06	<.05	0.01	<.02															
Zinc	0.03	<.01	0.04	0.03															

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 32A: BH 25-III

Constituent mg/L	DATE D/M/YR																		
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	29/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	7200 7500	8000	10000	7000	8000	-	3000	2600	2800	2400	2900	2900	3000	2700	1900	2500	1900	2500	2850	3200
pH	7.4 7.8	7.5	7.3	7.5	7.0	-	7.7	7.5	7.3	7.8	7.4	7.4	7.3	6.9	7.5	6.6	7.5	7.2	7.0	7.7
Chloride	57 50	57	61	106	61	-	23	23	15	30	30	30	23	60	15	2	8	5	14	1
Hardness	5100 5490													975						2225
Sulphate	6000 6600													1550						1760
Kjeldahl N	1.09 0.35													0.5						1.04
Nitrate	0.27 <0.1													1.75						0.98
Phenol	0.023 0.023													0.092						0
BOD	5 1.9													0						
COD																				37
TOC	3.5 7.5																			
Sodium	274 250													155						
Potassium	17.9 13.2													3.1						
Calcium	445 395													320						
Magnesium	590 1252													135						
Phosphorus P														0.32						
Cadmium														N.D.						
Chromium														N.D.						0.09
Copper														-						0.04
Iron														1.3						1.2
Lead														N.D.						
Manganese														<0.1						
Nickel														N.D.						<0.01
Zinc														N.D.						<0.01

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 32B: BH 25-III

Constituent mg/L	DATE D/M/YR																			
	28/01 1983	26/04	28/07	31/10																
Conductance	2050	2150	2600	2300																
pH	6.8	7.25	7.15	7.1																
Chloride	55	1.4	1.0	8																
Hardness	1722	1550	1770	1820																
Sulphate	1250	1075	1425	1260																
Kjeldahl N	0.48	0.32	0.71	0.32																
Nitrate	1.95	0.21	0.20	1.6																
Phenol	0.0	.061	.102	—																
BOD		0.4	1.0	< 1																
COD	29	11.8	17.6	< 5																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	< .10	< .10	0.04	< .10																
Copper	0.03	< .01	0.08	< .05																
Iron	1.12	0.33	0.87	< .05																
Lead																				
Manganese																				
Nickel	< .05	< .05	—	< .02																
Zinc	0.02	0.01	0.01	0.03																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 33A: BH 25-AI

Constituent mg/L	DATE D/M/YR																			
	PRE-DISPOSAL 1980	27/10 1980	28/11	23/12 1980	05/02 1981	02/03	25/03	29/04	22/05	25/06	29/07	07/08	24/09	15/10 1981	25/03 1982	26/05	22/06	30/07	25/08	19/10 1982
Conductance	5100 –	6000	6000	7000	6000	3500	5000	4500	5000	4000	5000	4000	5500	–	3300	4500	3500	4400	–	4300
pH	7.1 –	7.0	7.0	7.3	7.1	6.9	7.5	7.1	7.0	7.0	7.0	7.1	7.1	–	7.0	6.8	7.1	6.5	–	6.7
Chloride	76 –	98	121	106	91	135	98	121	91	122	99	106	76	–	83	8	6	66	–	1
Hardness	3600 –																			3115
Sulphate	3400 –																			2640
Kjeldahl N	0.73 –																			10.13
Nitrate	0.64 –																			0.06
Phenol	0.067 –																			0
BOD																				
COD																				59
TOC	3.0 –																			
Sodium	194 –																			
Potassium	11.1 –																			
Calcium	400 –																			
Magnesium	640 –																			
Phosphorus P	–																			
Cadmium	N.D. 0.02																			
Chromium	N.D. <0.02																			0.10
Copper	N.D. <0.05																			0.11
Iron	0.4 5.8																			3.6
Lead	<0.1 1.30																			
Manganese	1.2 2.10																			
Nickel	<0.1 0.07																			0.02
Zinc	<0.1 0.75																			0.03

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 33B: BH 25-AI

Constituent mg/L	DATE D/M/YR																			
	28/01 1993	26/04	28/07	31/10																
Conductance	4500	4400	4850	4100																
pH	6.8	6.65	6.6	6.8																
Chloride	55	78.0	21.0	135																
Hardness	3760	3460	3570	3410																
Sulphate	3150	2700	3050	2760																
Kjeldahl N	268	1.76	8.56	6.12																
Nitrate	<0.01	0.02	0.01	0.3																
Phenol	0.0	—	.0408	.357																
BOD		4.9	22.0	24.0																
COD	30	17.6	51.5	40.0																
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium	0.2	<.10	0.05	<0.01																
Copper	0.06	0.06	—	<0.05																
Iron	1.51	2.02	2.72	0.2																
Lead																				
Manganese																				
Nickel	<0.05	<.05	—	—																
Zinc	0.02	0.08	0.01	0.01																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 34 : UPSTREAM BUCKHORN CREEK

Constituent mg/L	DATE D/M/YR																		
	19/10/82	28/01/83	31/10																
Conductance	1800	1200	420																
pH	7.1	7.2	6.5																
Chloride	64	47	35																
Hardness																			
Sulphate																			
Kjeldahl N																			
Nitrate																			
Phenol																			
BOD																			
COD																			
TOC																			
Sodium																			
Potassium																			
Calcium																			
Magnesium																			
Phosphorus P																			
Cadmium																			
Chromium																			
Copper																			
Iron																			
Lead																			
Manganese																			
Nickel																			
Zinc																			
Dissolved Oxygen	10.8	10.2	6.7																

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 35 : BUCKHORN CREEK AT TOWNLINE ROAD

Constituent mg/L	DATE D/M/YR																			
	31/10 1982	29/01 1983	31/10																	
Conductance	1050	1400	700																	
pH	6.9	7.0	6.7																	
Chloride	168	74	56																	
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate																				
Phenol																				
BOD																				
COD																				
TOC																				
Sodium																				
Potassium																				
Calcium																				
Magnesium																				
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				
Dissolved Oxygen	10.2	11.8	10.2																	

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
GLANBROOK SANITARY LANDFILL SITE
WATER CHEMISTRY

TABLE 36 : DOWNSTREAM BUCKHORN CREEK

Constituent mg/L	DATE D/M/YR																			
	19/10 1982	28/01 1983	31/10																	
Conductance	1200		660																	
pH	6.9		7.3																	
Chloride	86		53																	
Hardness																				
Sulphate																				
Kjeldahl N																				
Nitrate		W																		
Phenol		J																		
BOD		M.P																		
COD		E																		
TOC		C																		
Sodium		S																		
Potassium																				
Calcium		O																		
Magnesium		N																		
Phosphorus P																				
Cadmium																				
Chromium																				
Copper																				
Iron																				
Lead																				
Manganese																				
Nickel																				
Zinc																				
Dissolved Oxygen	9.2		11.3																	

APPENDIX C

GRAPHS

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

MANHOLE 1

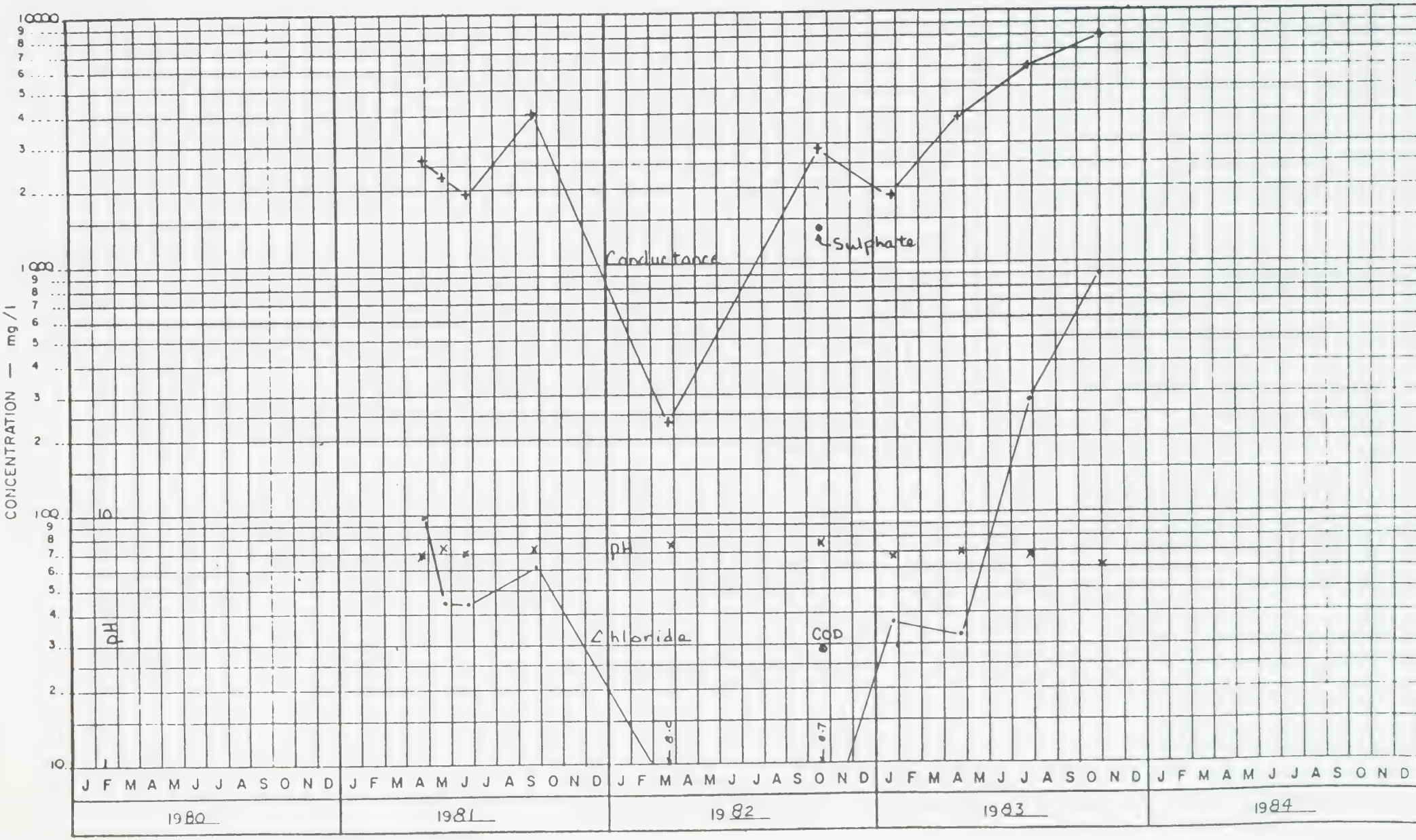


FIGURE 1

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

MANHOLE 3

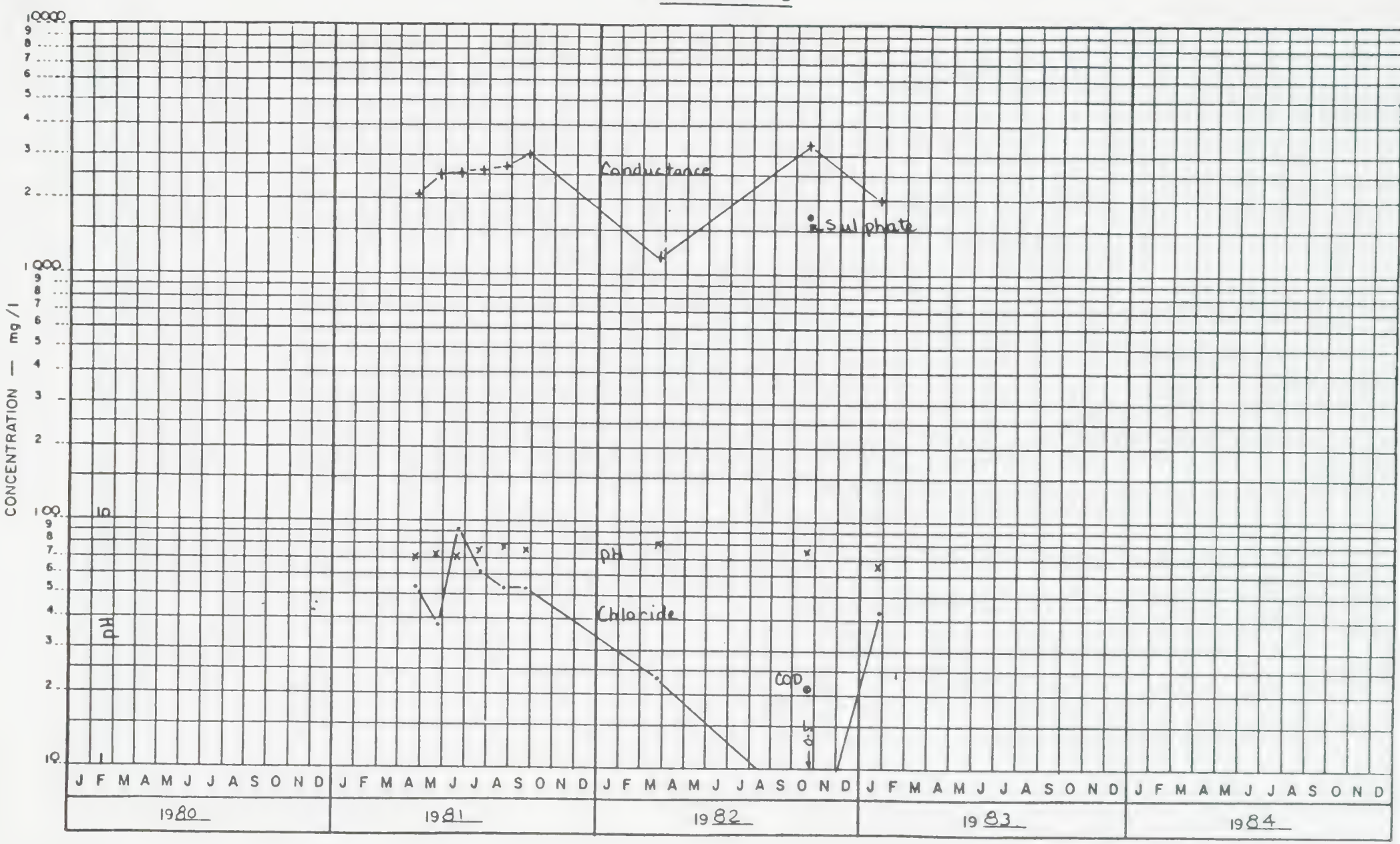


FIGURE 2

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

MANHOLE 4

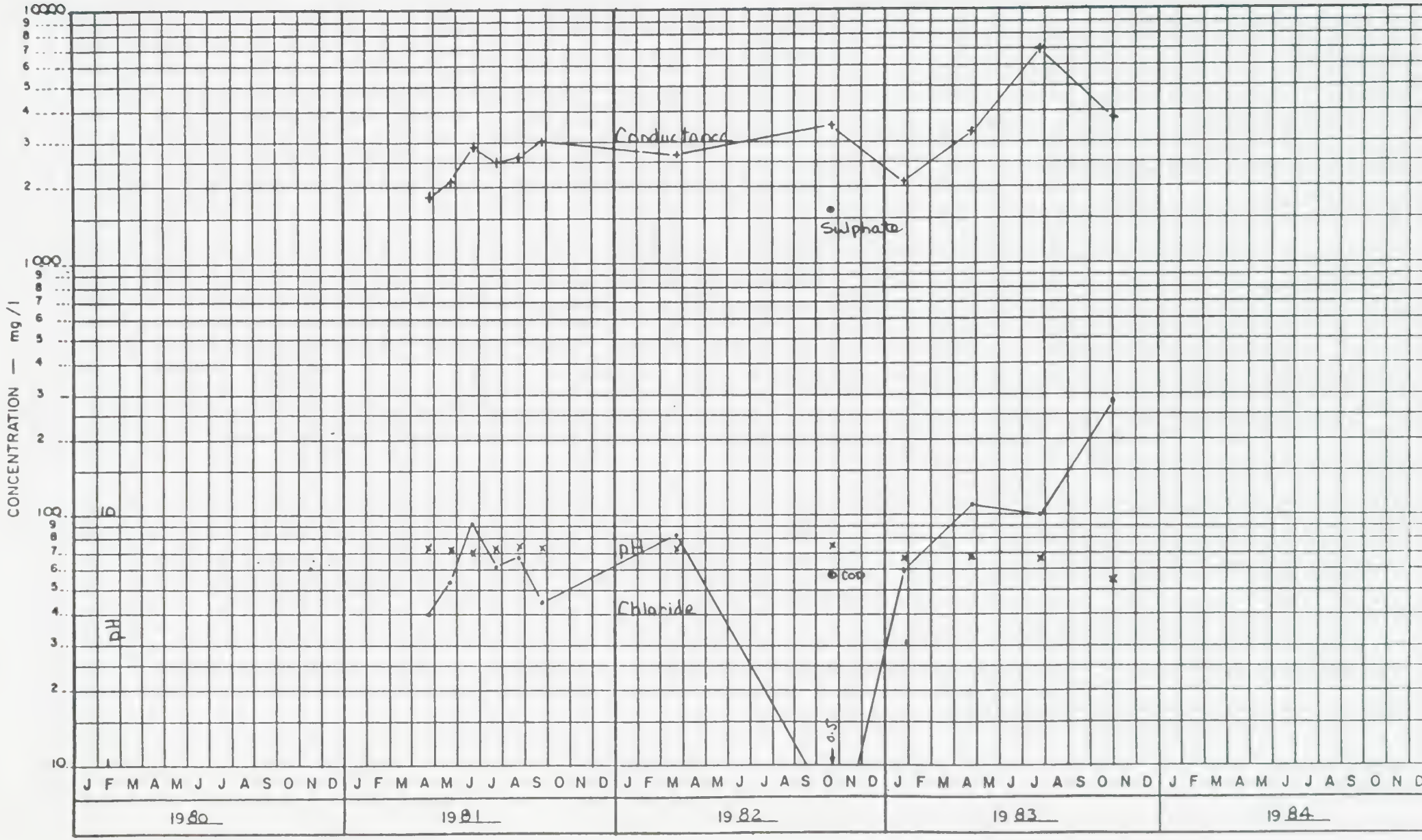


FIGURE 3

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 13-I

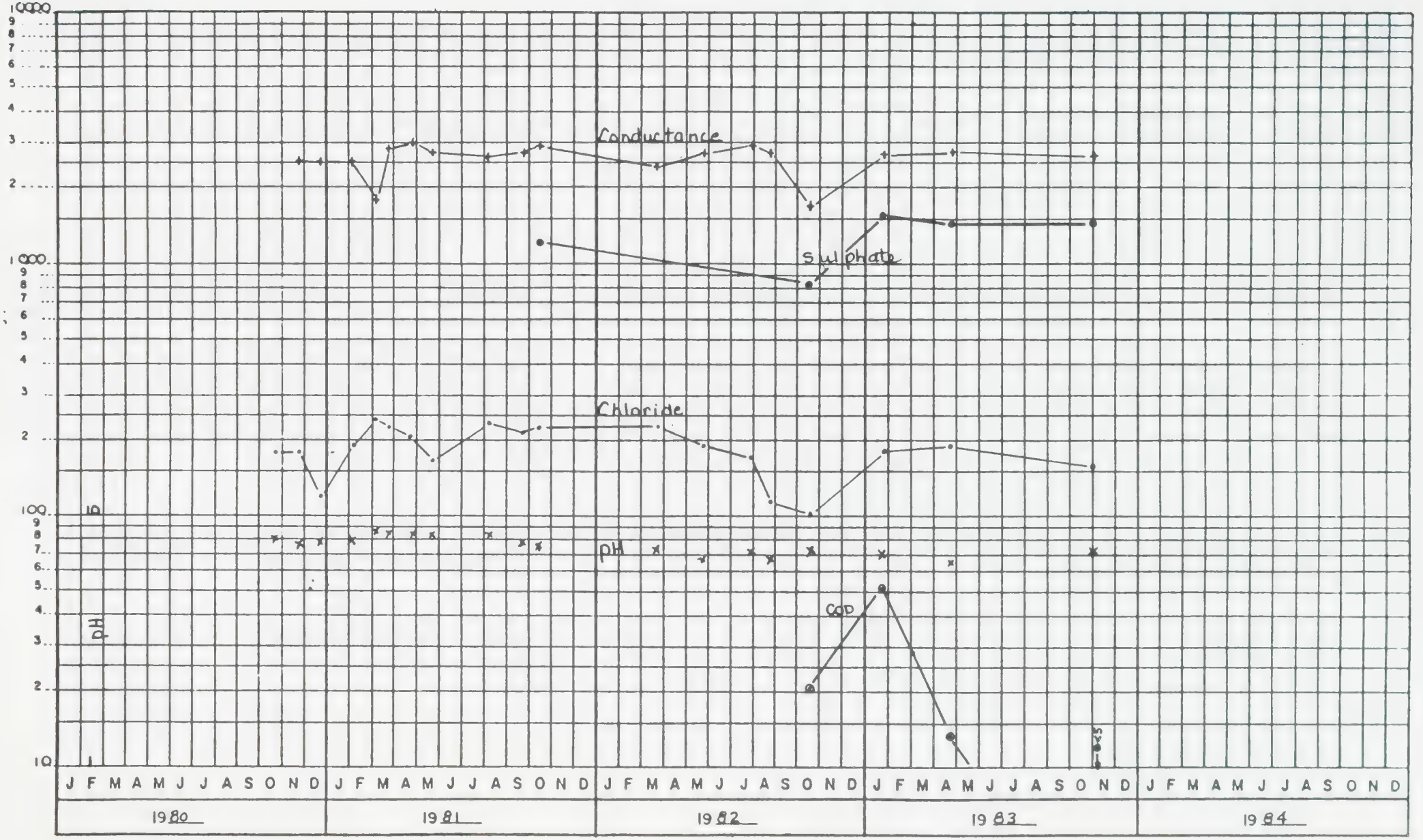


FIGURE 4

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 13-11

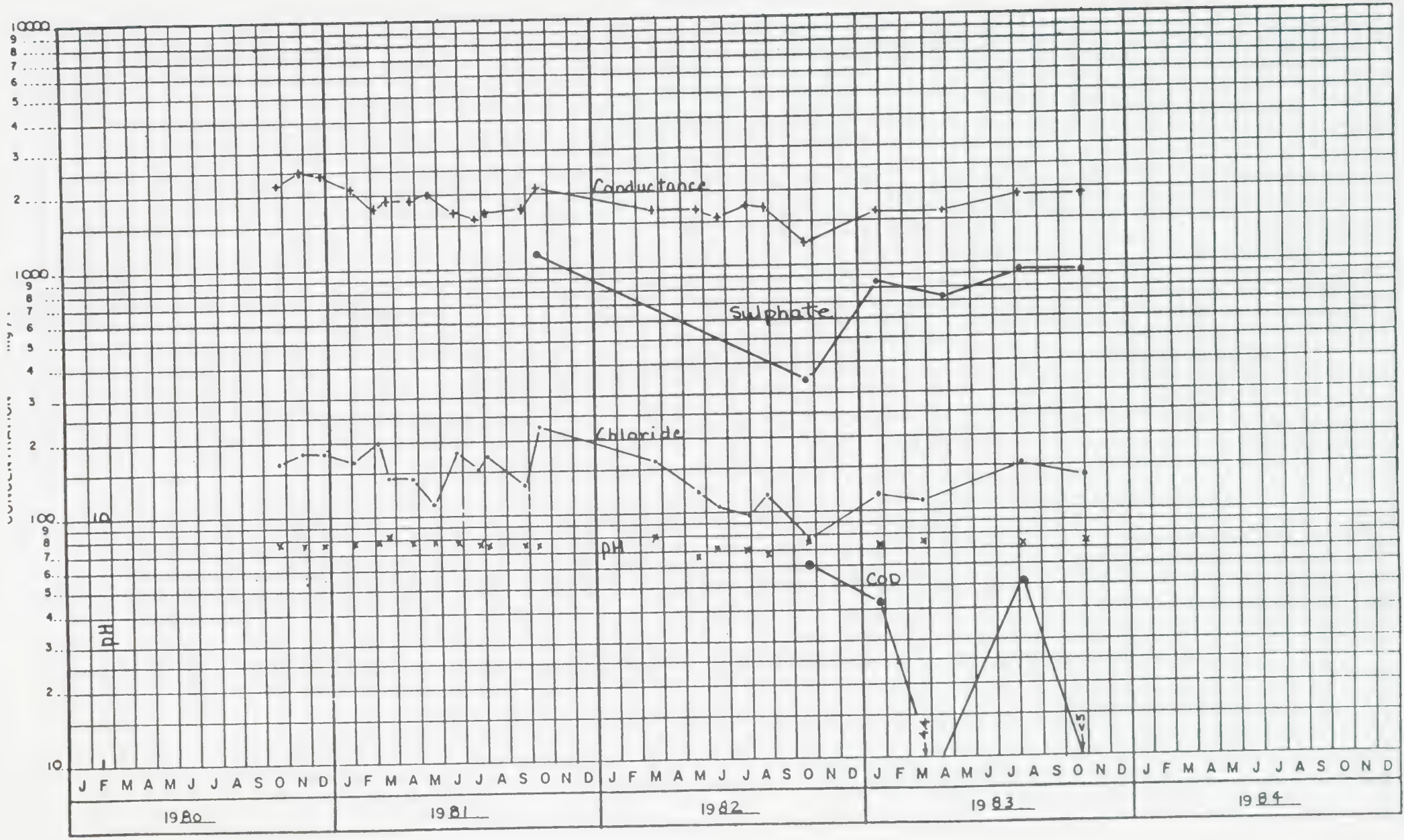


FIGURE 5

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 13- IV

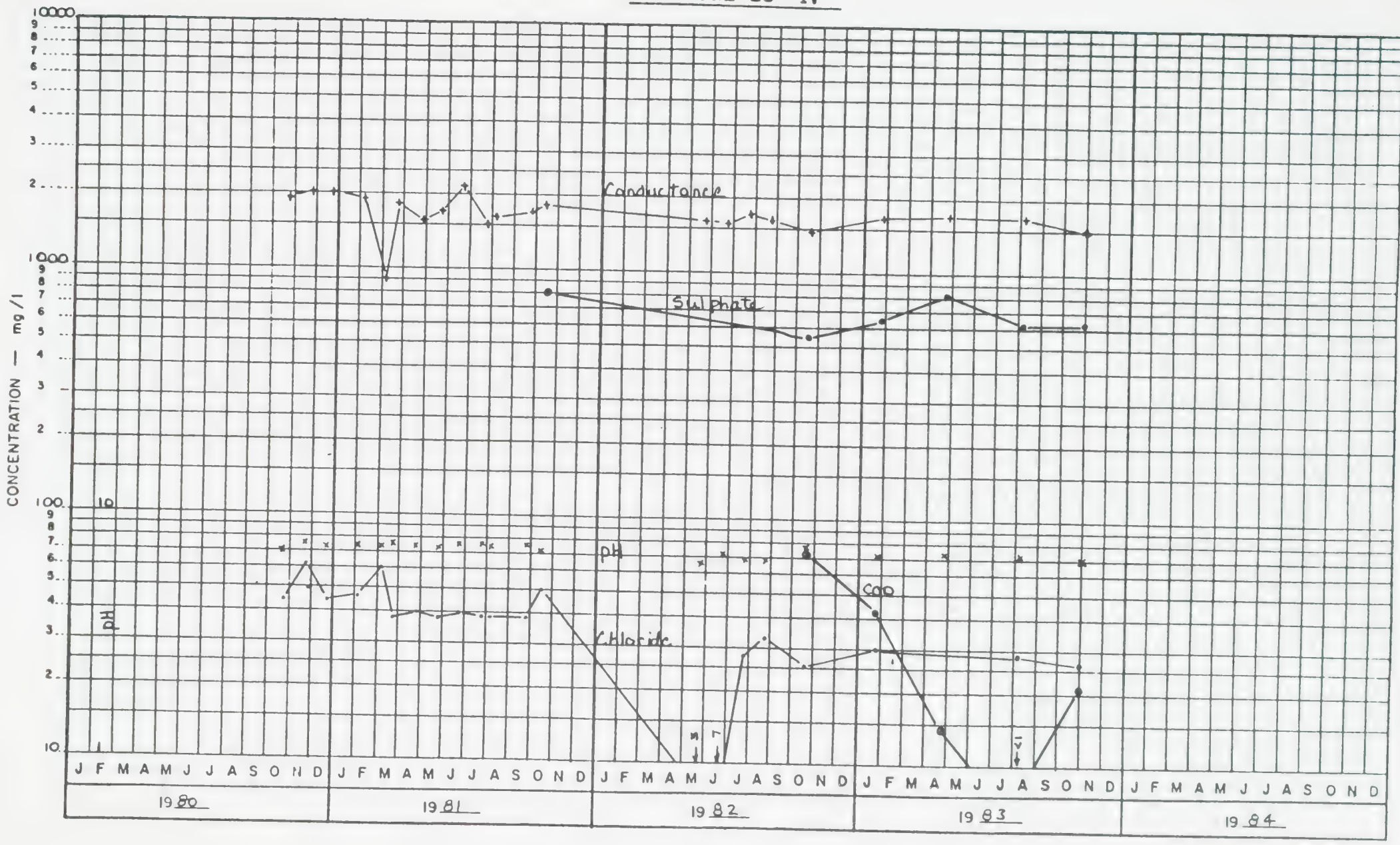


FIGURE 6

REGIONAL MUNICIPAL OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHILE 14-I

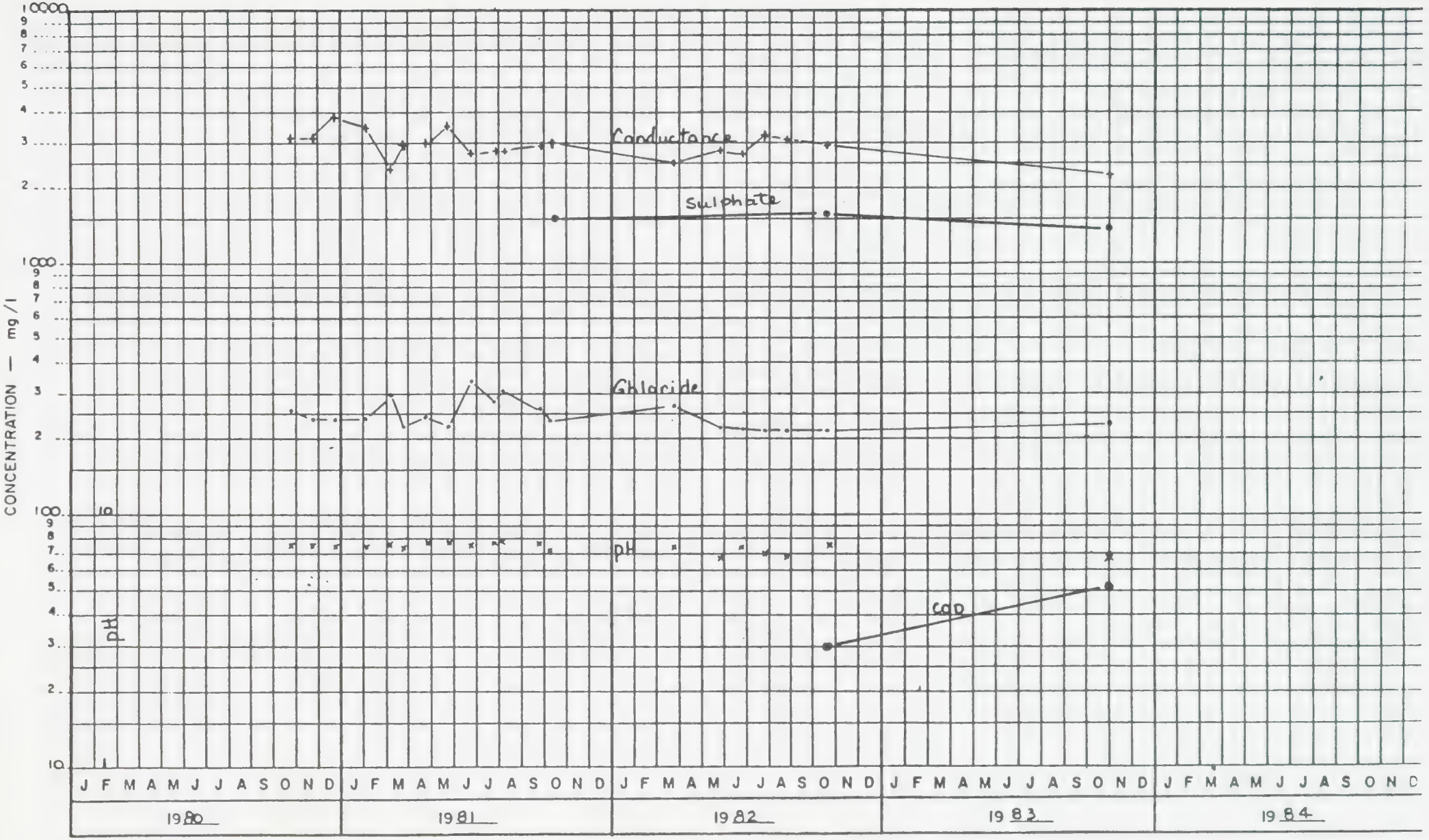


FIGURE 7

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 14-II

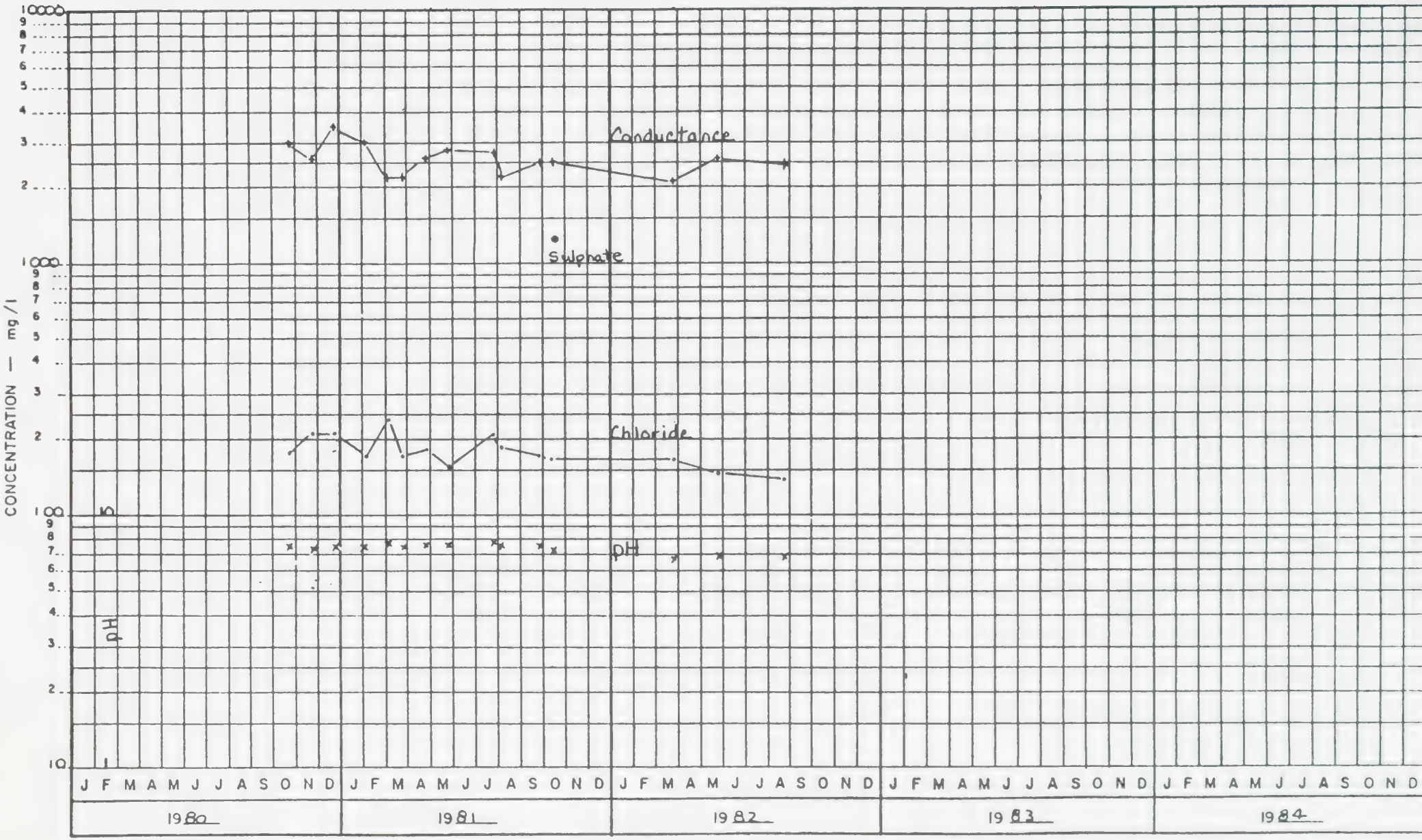

CONCENTRATION — mg/l
Conductance
Sulphate
Chloride
pH
pH
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1980
1981
1982
1983
1984

FIGURE 8

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 22-I

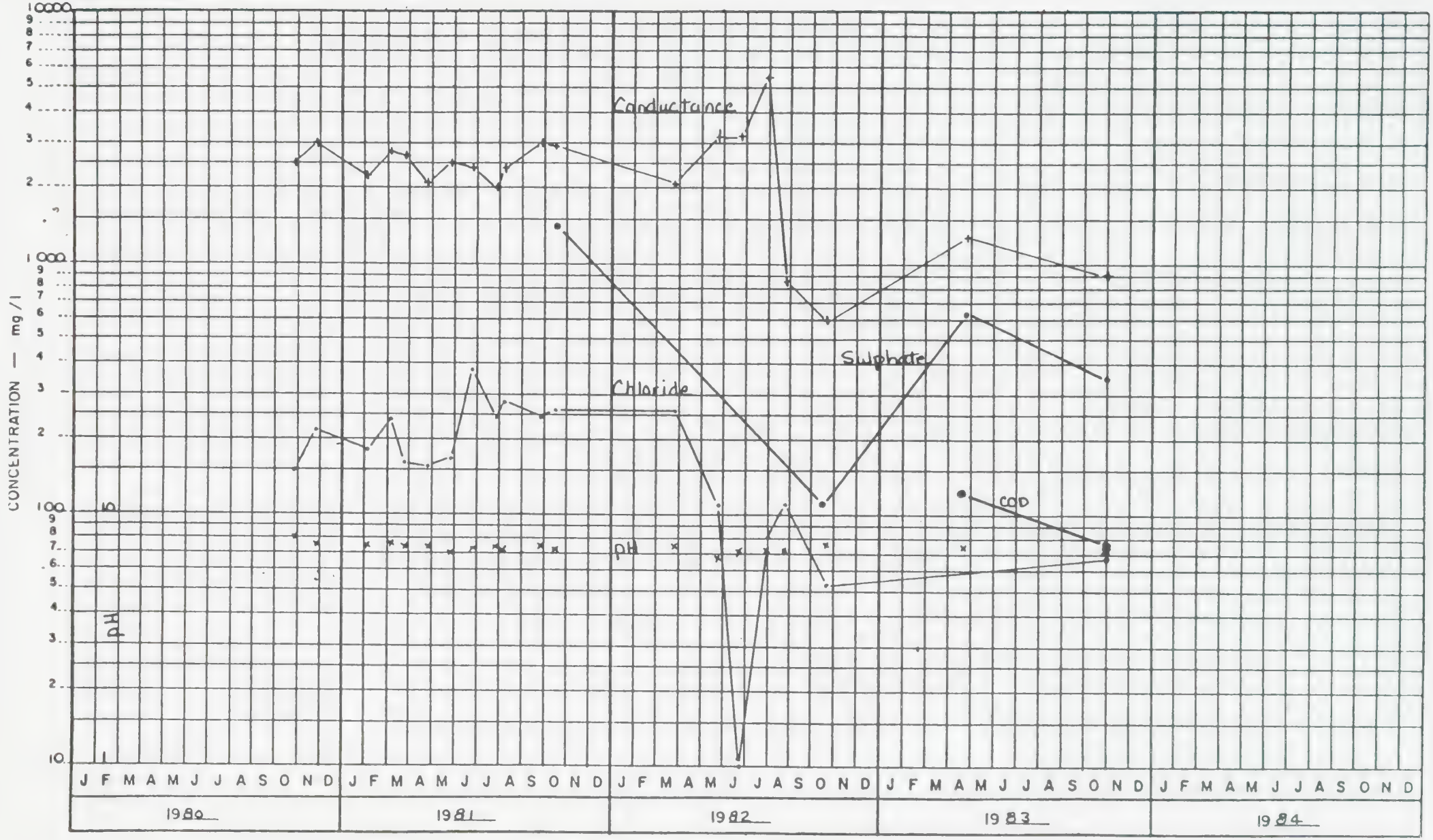


FIGURE 10

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 22-II

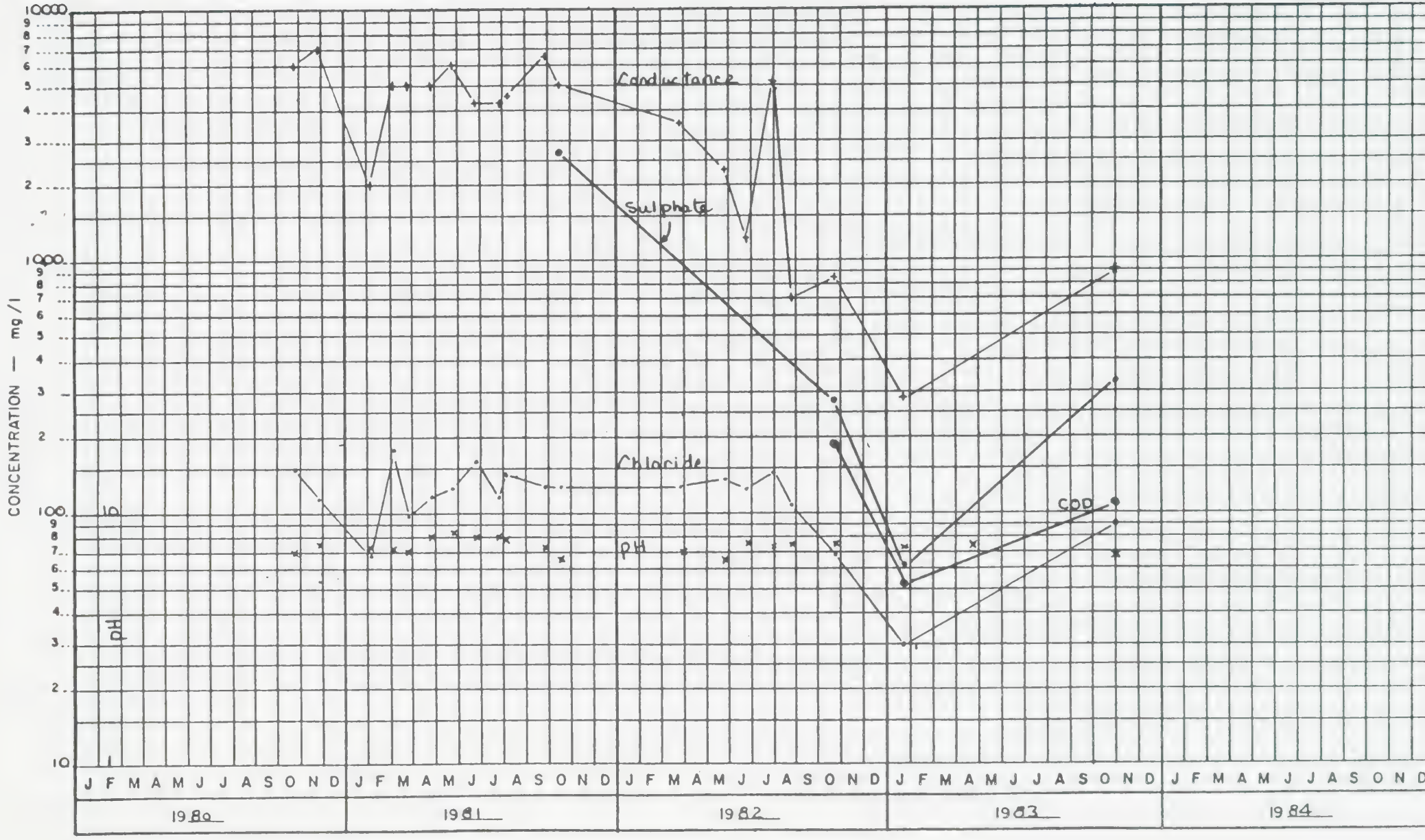


FIGURE 11

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 24-I

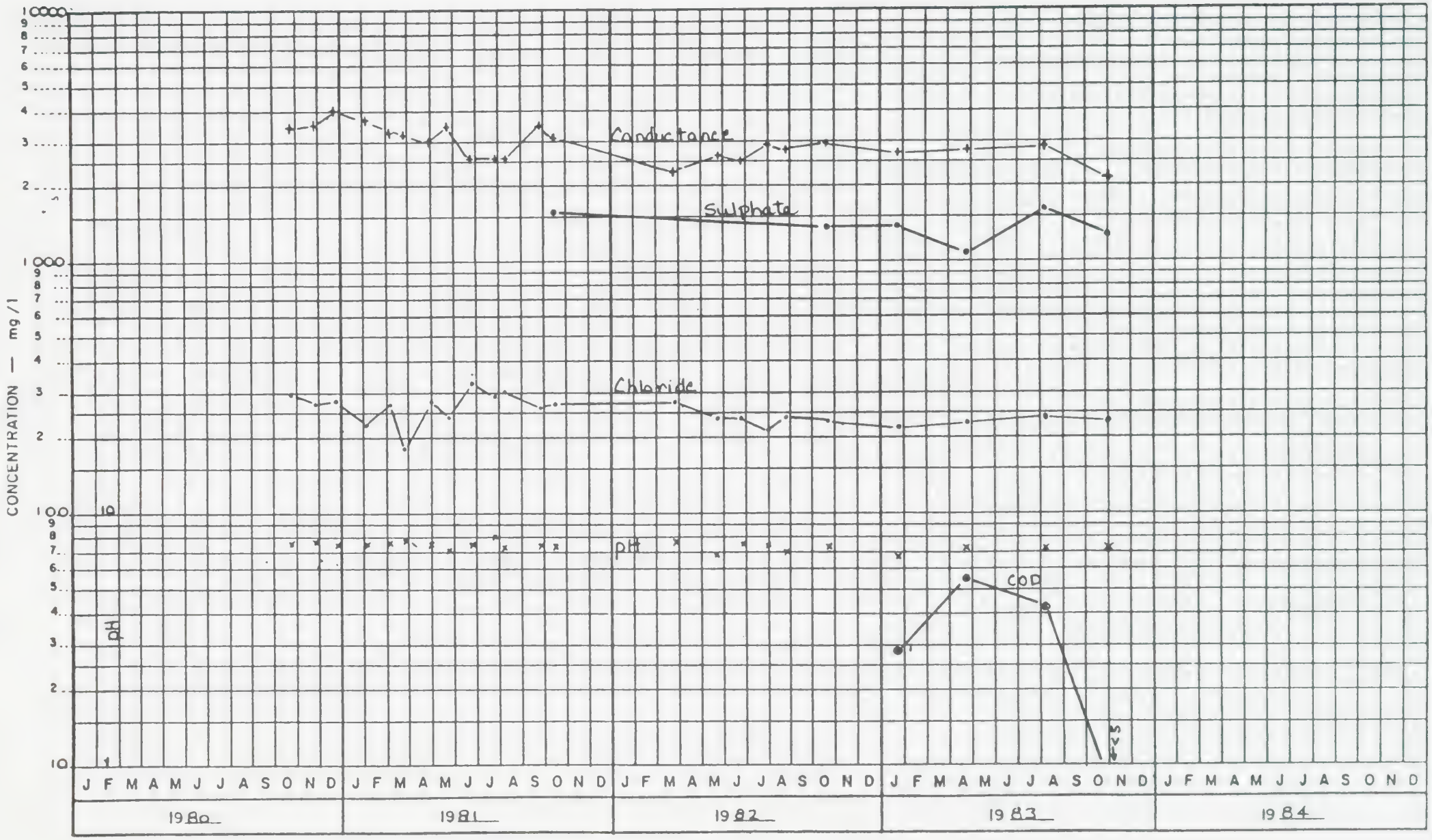


FIGURE 12

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 24-II

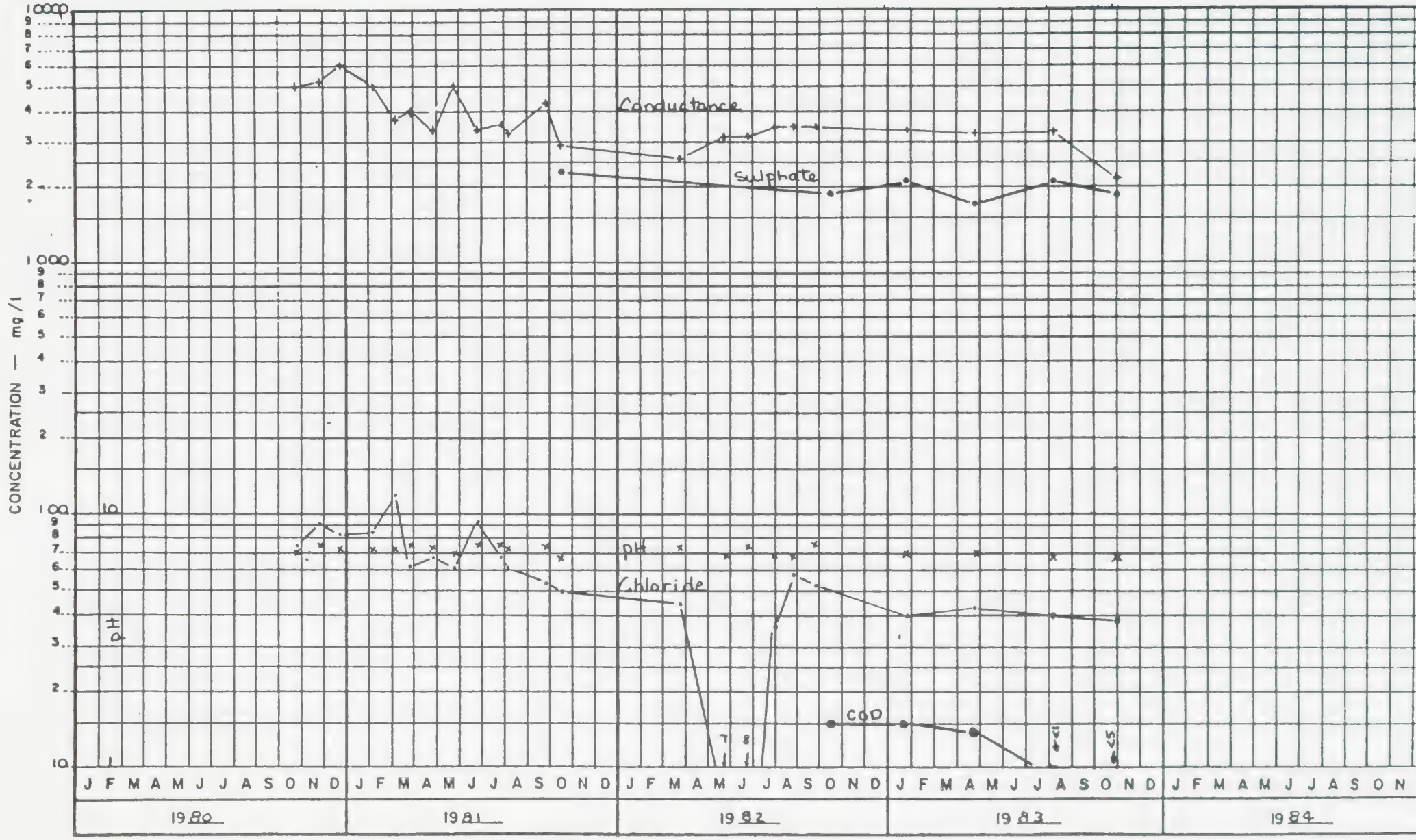


FIGURE 13

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 24-III

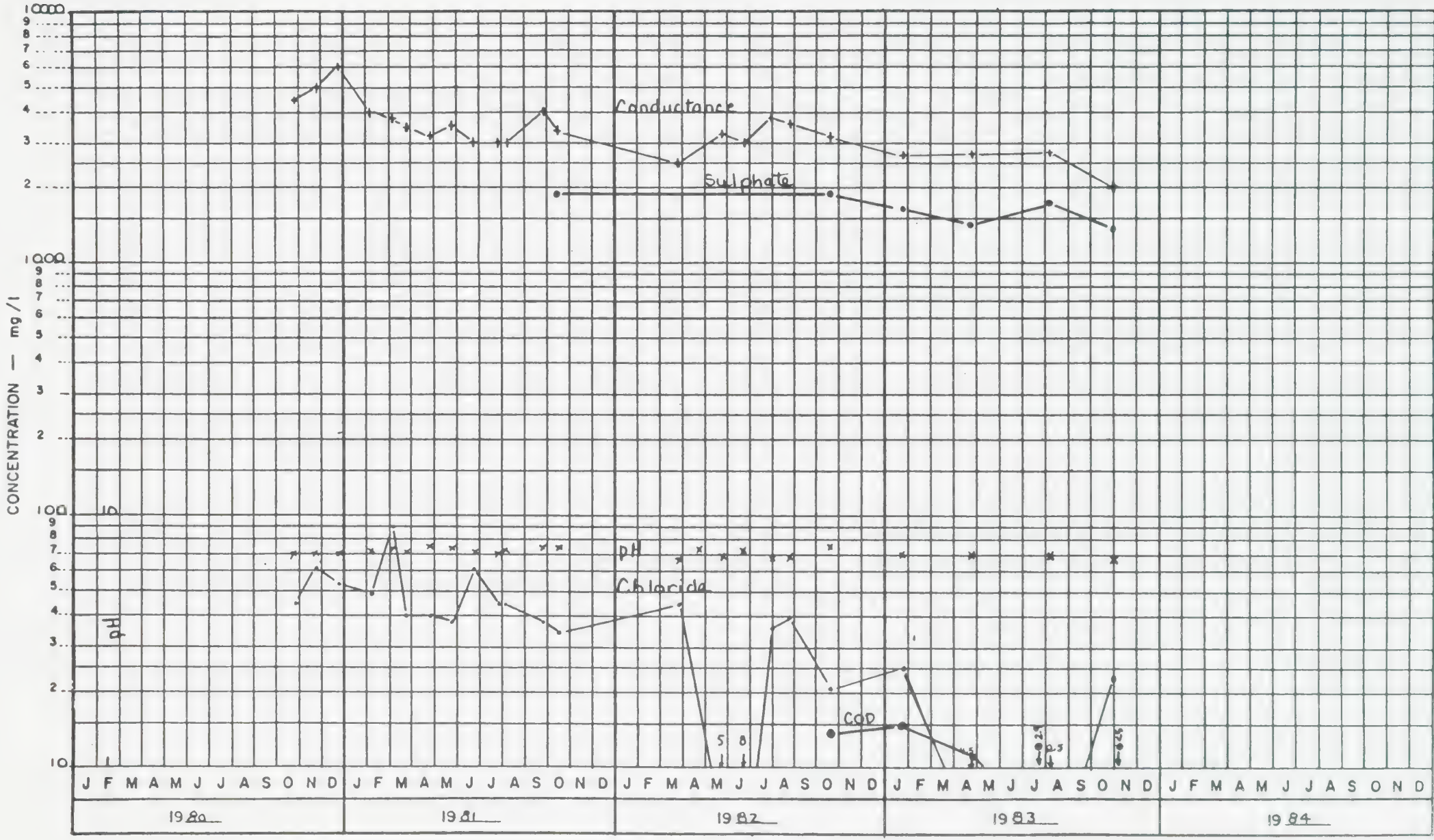


FIGURE 14

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 25-I

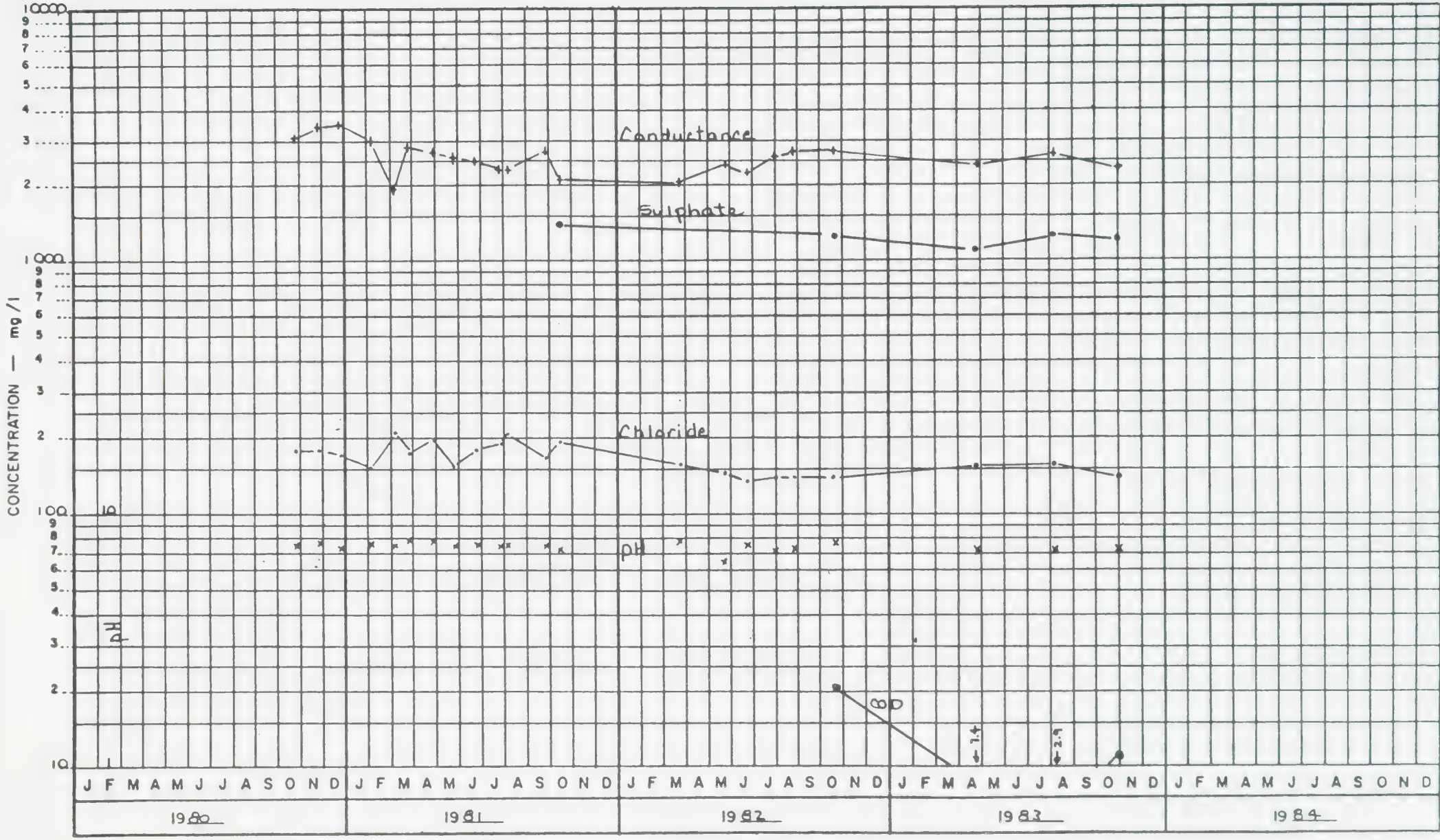


FIGURE 15

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 25-II

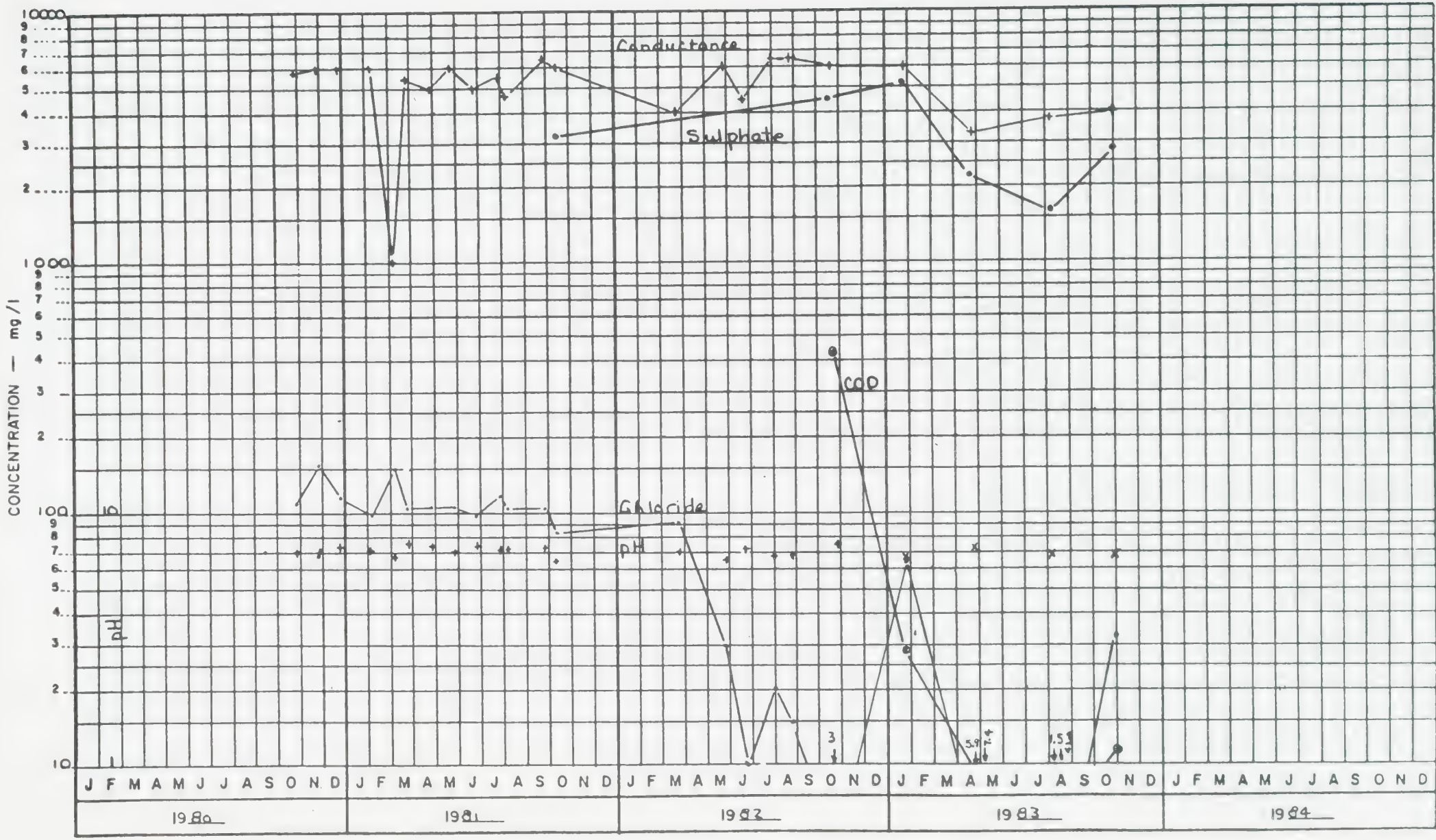


FIGURE 16

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 25-III

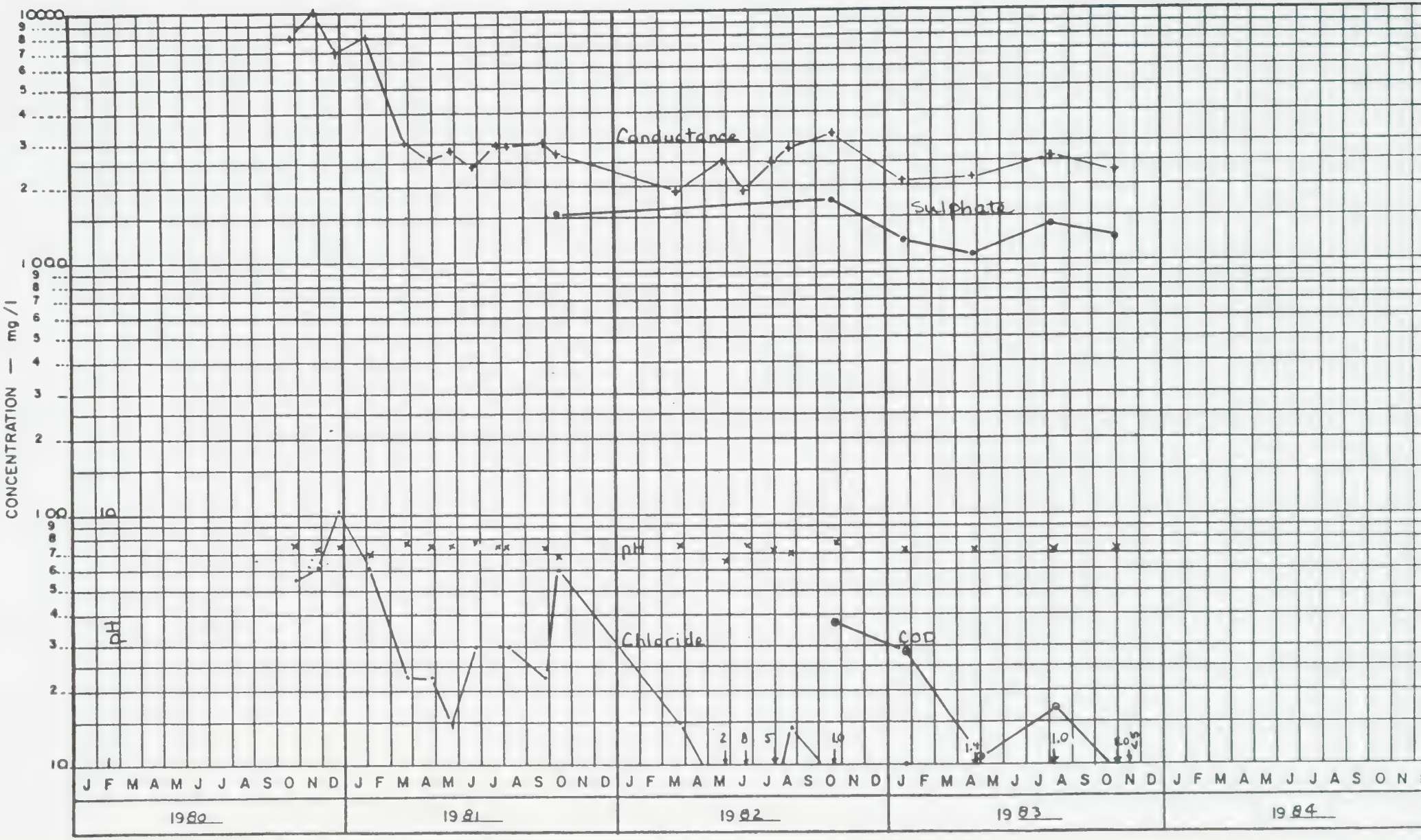


FIGURE 17

REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
REGIONAL LANDFILL SITE
WATER CHEMISTRY

BOREHOLE 25A-I

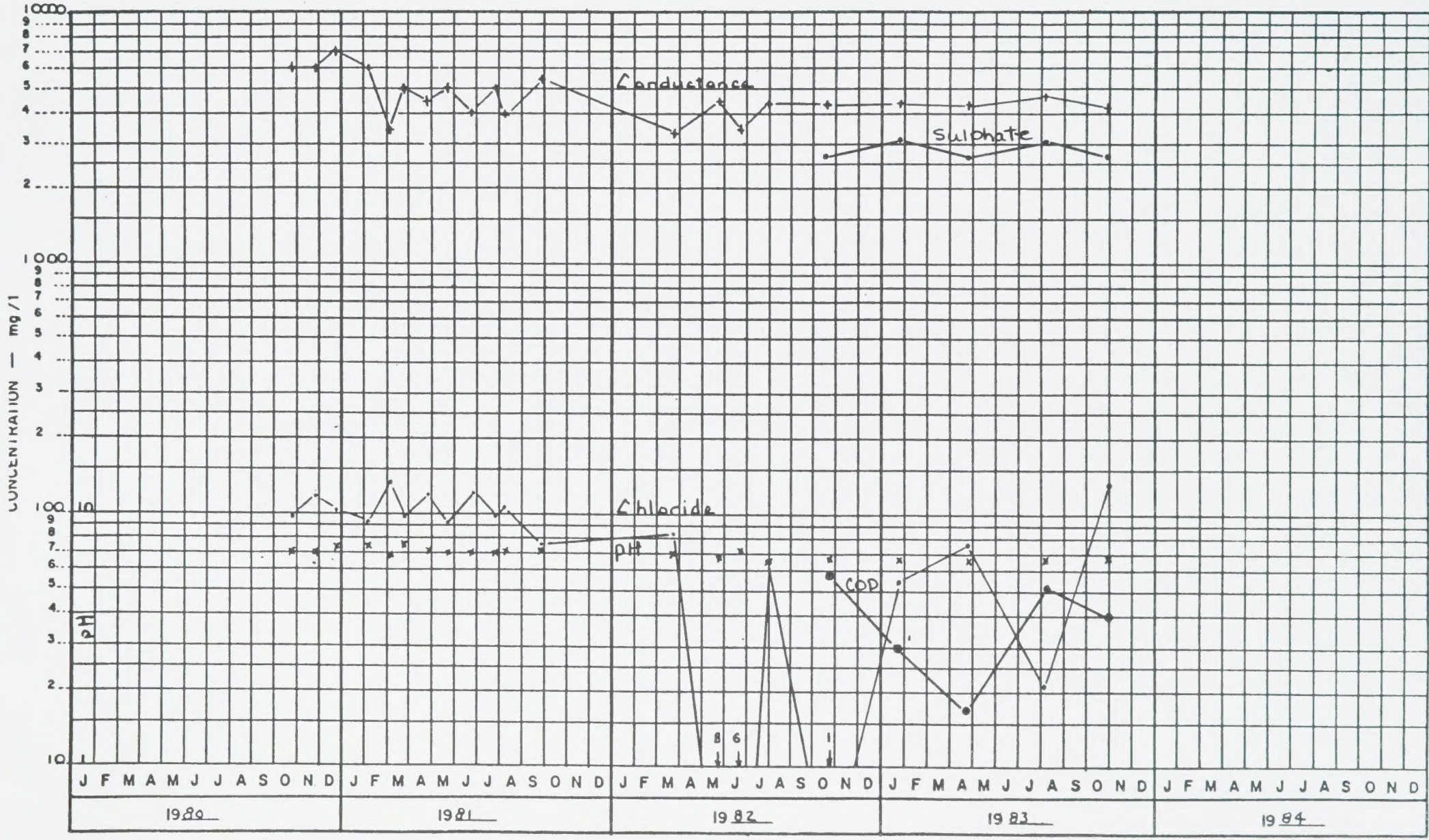


FIGURE 18

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